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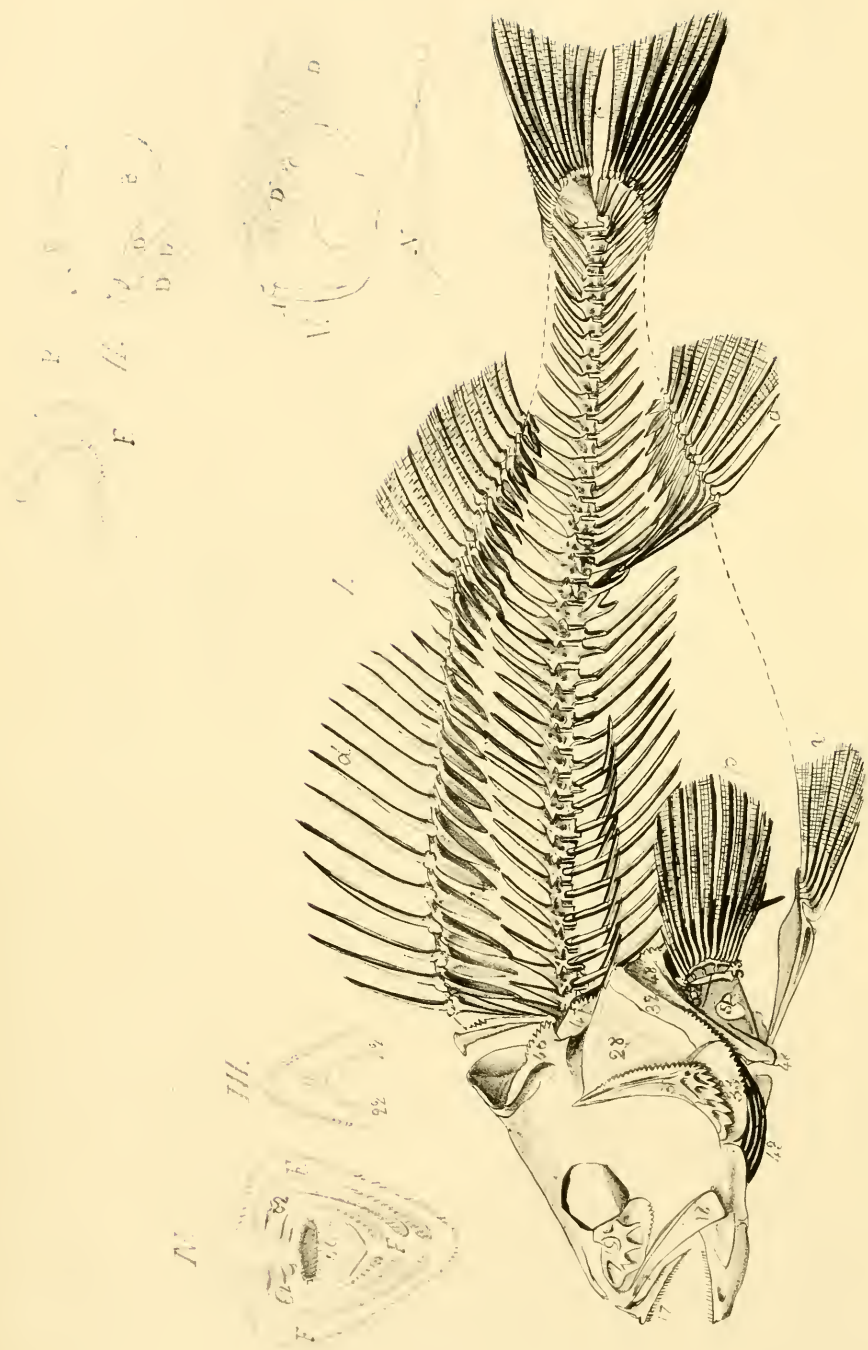
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# A HISTORY

OF

# THE FISHES OF MADEIRA.

BY

RICHARD THOMAS LOWE, M.A.

BRITISH CHAPLAIN.

WITH

ORIGINAL FIGURES FROM NATURE OF

ALL THE SPECIES,

BY

THE HON. C. E. C. NORTON AND M. YOUNG.

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# FISHES OF MADEIRA.

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## INTRODUCTION.

IN the present state of systematic Ichthyology, and particularly in a work which undertakes, for the first time, to register at intervals the natural productions of a coast and ocean unexplored, it has appeared a requisite precaution against the alterations or displacements likely to be caused by fresh discoveries, to postpone, during the course of publication, all attempts at method or arrangement to the end.

In most undertakings of this kind, the probability of such disturbance is diminished by the more advanced state of knowledge generally on the subject, or by the local observations and experience of others. Their author either has immediate opportunities of appealing to the records of his predecessors, and to the judgment of contemporaries; or, by removal from the field of his researches, he is effectually debarred all access to additional materials derived from the spot.

The circumstances in the present case are different. Ichthyology, viewed whether in its systematical arrangements, or as a simple register of forms, is so comparatively in its infancy, that almost every month produces some addition to its lists, demanding fresh modifications of its groups and families. The author has to pioneer his way alone, not only through a region altogether new and unexplored in this department, but through one which, peculiarly rich as it has proved already, he is confident is yet far from exhausted, and which he is likely to continue to explore. He will not therefore lay down the ground-work of his chart, or trace his line of route definitively, so long as any opportunity remains for correcting its bearings, or improving its direction.

There are, however, doubtless many persons whom this plan, without some accompanying corrective to its disadvantages, would exclude from any interest in the following pages; and who might decline to step into a labyrinth of forms and names, without some clue to guide them through its seeming intricacies. For such, the following sketch of the present state of systematic Ichthyology is offered; which, if deficient or super-

fluous in the eyes of the experienced naturalist, will serve to give the general ideas intended for the use of others, and to facilitate the reference of the Madeiran fishes to their respective families or groups.

Be it assumed then, and merely on the quite sufficient principle, “Si non rogas, intelligo,” that it is known with somewhat more than popular, though not with scientific accuracy, what constitutes distinctively a fish. I mean, that although a person may not be able to give technically a precise or abstract verbal definition of the tribe, he yet, by reference to their vertical instead of horizontal tail, — their breathing water, instead of air immediately, by means of gills, not lungs, — and to their generally laying spawn or eggs, which they desert, instead of always bringing forth their young alive and subsequently suckling them, — shall be able to distinguish any of the families of fishes from the mammiferous, phocaceous, or cetaceous tribes of Seals, Whales, Dolphin, Grampus, Porpessæ, Dugong, Manati, &c. One door to error is thus closed. Again, and on the other hand, he is supposed to know that the presence of a vertebral or spinal column, excludes a vast mass of other co-inhabitants of the water; which are primarily distinguished by the absence of this bone, and therefore called the *Invertebrata*. Such are all Shell-fish, Lobsters, Crabs, Shrimps, Mollusks, Cuttle-fish, Jelly-fish, Star-fish, Worms, Polypi, &c.

There still remains a large residue of well-known striking animals, consisting of the Sharks, the Skates or Rays, the Sturgeons, Lampreys, Sun-fishes or Globe-fishes, and Pipe-fishes, blended with the true fishes; of which they form collateral and aberrant, or more or less anomalous groups: being externally, by form and habits, and internally, by structure and organization, more nearly related to these, than to any other tribe of animals. It must, however, be remembered, that they form of these, in general, co-ordinate or collateral, not subordinate or essentially inferior groups: the organization of some, *e. g.* the Sharks and Rays, tending evidently towards the structure of the higher animals, through the class of Reptiles; whilst that of the Lampreys, on the other hand, approaches downwards towards the Worms, *i. e.* towards the higher Mollusks, or *Cephalopoda*.

These groups then constitute, in scientific phraseology, the families *Syngnathidæ*, Pipe-fishes and Hippocampuses; *Diodontidæ* and *Balistidæ*, Sun-fishes, and File-fishes; *Sturionidæ*, Sturgeons; *Squalidæ*, Sharks; *Raidæ*, Skates and Rays; and *Petromyzidæ*, Lampreys. They are placed by Cuvier at the end of the more obvious or true fishes. The two former compose, respectively, the last two orders of the six into which he divides his first series, or “Poissons ordinaires.” The four latter are united together, under the name of *Chondropterygianæ*, in allusion to their common character of cartilaginous (χόνδρος) instead of fibrous bones or



fin-rays ; forming what he considers as a secondary branch or series closing the great class of fishes.

The large majority remaining, cleared as it now is of most of its more puzzling, ambiguous, or aberrant forms, may for convenience, and without disturbing any very close affinities, as by the illustrious Cuvier, after Ray and Artedi, be first divided into two great series : viz. the Acanthopterygian and Malacopterygian fishes ; the first having pungent, or, at least, inarticulated bony rays (*ἄκανθαι*, *spines*,) at the fore part of the back (*dorsal*) and belly (*anal*) fins, such as the Perch, Garoupa, John Dory, Mackerel, Tunny, Red and Grey Mullet, &c. ; and the second or soft-finned fishes, (*μαλακαί*, *soft*, and *πτερυγες*, *wings* or *fins*,) comprising those in which all the rays are soft or flexible, and jointed or barred ; such as the Cod, Haddock, Herring, Turbot, Flounder, Sole, &c. inhabiting salt water ; and most fresh-water fishes, as the Carp, Gold-fish, Salmon, Gudgeon, Trout, Pike, Eel, &c.

The principal subordinate groups, or families as they are called, into which the first of these two main divisions has been next resolved, are the following :

#### I. ACANTHOPTERYGIANS,

or, *Spiny-finned Fishes*.

*Percidæ* :—The Perch tribe or family. Allowing for all the dismembersments which seem requisite, this group will probably remain the most extensive of the series, excepting the *Scombridæ*. It is characterized by a greater or less degree of armour about the head, caused by the presence of teeth or spines on the cheeks, and opercles (gill-covers) or their edges ; and by two narrow bands of numerous close-set teeth on the sides (palatines), and a heart-shaped plate of the same in front (on the vomer) of the roof of the large mouth within, besides the ordinary ones on the edges of both jaws, which are also generally numerous. If there are no spines on the opercle, the pre-opercle is toothed at the edge ; or, *vice versâ* : if the pre-opercle is not toothed, there are spines on the opercle.

The shape of these fishes is usually oblong, compressed, neither very deep nor much elongated ; their scales are generally harsh and rough to the feel, or ciliate ; their colours brilliant ; red, brown, orange, and yellow being the predominant tints. A few inhabit fresh water, but most the sea. Their flesh is generally excellent, free from fat or oily qualities.

Examples :—Perch, Basse, Weever or Sting-fish of England ; Cherne, Garoupa, &c. of Madeira.

*Mullidæ* :—The Red Mullet tribe.

A small well-marked group, which assuredly ought to be separated from the *Percidæ* ; from which they may be easily distinguished by their

rounded thickened form, short cubic head, and large deciduous smooth scales covering the head, cheeks, and opercles, which are all unarmed and even. This latter character will prevent their being confounded with the *Triglidae*; to some of which, viz. the true Gurnards (*Trigla*), they bear in shape considerable resemblance. The mouth is feebly armed with teeth on the Percidous plan. The branchial opening is very large. There are two separate triangular, short, dorsal fins. Internally, their *cæca* are numerous.

Examples:—The striped and plain Red Mullet; the “Salmonéte” of Madeira; and here, I think, also belongs a rare fish of hitherto doubtful affinity, placed at the beginning of *Percidæ*, near *Apogon*, by Cuvier and Valenciennes, but to which genus its relation seems to be one rather of analogy than of affinity,—the Ribaldo of Madeira, *Pomatomus telescopus*, Risso. Its anatomy agrees perfectly with that of the Red Mulletts, except that it has a large, anteriorly emarginate, or bilobed air-bladder.

*Berycidæ*:—The Beryx or Alfonsin tribe.

This is another small group, by Cuvier included amongst the *Percidæ*, which may be advantageously detached. They are characterized by an extremely short muzzle, large eyes, enormous mouth, well armed with broad bands of minute teeth, the bones of the head prominent and rough, scales very rough. The dorsal fin is single, high in front, and with only a few striate, generally crowded spines. The ventral fins are anomalous in the number of their rays. Internally, the cæcal appendages are excessively numerous, forming a dense bundle.

Examples:—The Alfonsins of Madeira (*Beryx decadactylus*, Cuv. and *B. splendens*, nob.); *Trachichthys pretiosus*, nob. (*Hoplostethus mediterraneus*, Val.); and Salmonéte do alto (*Polymixia nobilis*, nob.).

*Sphyrænidæ*:—The Spet, Sea-pike, or Barracuda tribe.

This is another small group, requiring separation from the *Percidæ*; amongst which they are, however, much better placed by Cuvier than by some of the older naturalists, who, mistaking certain resemblances of analogy for real affinity, had formerly arranged these fishes near the common Pike (*Esox lucius*, L.). Their elongated slender form, and narrow pointed muzzle, and long and formidable teeth, which led to this erroneous association, will serve at once to distinguish them from most of their less apparently near, but really close allies, the *Percidæ*. A not less striking character is the abdominal position of their ventral fins, considerably behind the pectoral fins; but this, perhaps, ought not to be considered of primary importance, in order to admit *Percophis*, Cuv. The two dorsal fins are, in at least the normal species, triangular and separate, as in the *Mullidæ*; the rays of the first being truly spinous. The scales are smooth and rather soft. The *pylorus* is surrounded by numerous *cæca*. The general tints

are silvery-lead. The head and opercles are plain ; not armed with spines or teeth, as in *Percidæ*.

Examples :—The Spet of Languedoc, Luzzo or Lucio di mare of the Italians ; Barracuda of the West Indies ; Bicuda of Madeira (*Esox sphyraena*, L.).

*Triglidæ*:—The Gurnard tribe (Les Joues cuirassées, Cuv.): latterly, by Cuvier, separated from the Perehes, with which they have most characters in common, on account of the cuirass-like expansion of the bony plates about their cheeks and head, giving them a peculiar physiognomy.

Examples :—The Gurnards, Piper, River Bullheads, Sticklebacks of England ; and the Cabra, Carneiro, Requeime, &c. of Madeira.

*Scianidæ*:—The Maigre or Umbrina tribe.

This group, as at present constituted, is rather a subordinate series of *Percidæ* than a truly distinct family ; differing in no respect but in the absence of palatal teeth, and offering also, in parallel order, precisely the same combinations of other characters. Even the cavernous structure of the head-bones is neither universal nor peculiar. It is wanting in a number of genera ; whilst it is present in other fishes placed in other families : e. g. in *Trachichthys*, placed amongst *Percidæ*, and *Monocentris* in *Triglidæ*, by Cuvier himself. The absence of palatal teeth is even less to be relied on ; as is proved by the same illustrious ichthyologist having been compelled to place amongst *Percidæ*, not *Trachichthys* only, in which they are feeble or evanescent, but several other genera, in which they are as completely wanting as in any of his *Scianidæ*. These teeth are also wanting in *Synanceia*, placed amongst *Triglidæ*, in which they are generally present.

But the great objection against keeping up this family in its present form as hitherto defined, is, that it causes the separation of genera so closely allied in other respects that they are scarcely distinguishable ; and this, in deference only to a single artificial character, which is itself most variable, and of very little value, either in itself, or as indicative of more important differences of habit, food, or structure : a fact which might be proved by instances innumerable. Thus *Hæmulon*, *Pristipoma*, &c. are separated far from their natural Percidous allies, *Centropristis* or *Dules*, *Therapon*, *Datnia*, *Pelates*, and *Helotes* : whilst, as if to stamp more strikingly the perfect futility of such a separation, founded on the presence or absence of palatal teeth alone, the three latter genera of *Percidæ* have absolutely none ; and in *Therapon* they are actually present or absent in different individuals of the same species.

Several genera of small fishes, (*Amphiprion*, *Premnas*, *Pomacentrus*, *Dascyllus*, *Glyphisodon*, *Etroplon*, and *Heliastes*,) placed by Cuvier at the end of his *Scianidæ*, and characterized by their short oval shape, sealy

fins, and lateral line terminating at the end of the dorsal fin, in any case belong rather to the *Chatodontidae*.

Hence it is plain the *Scianidae* require entire re-modelling, both as to characters and limits. And then it may be possible, as it is perhaps desirable, to retain under a distinct family name at least some part of its constituents; such as its more genuine typical forms, *Sciana*, *Otolithus*, *Ancylodon*, *Corvina*, *Umbrina*, *Pogonias*, &c. which have the air-bladder so curiously furnished with appendages, in addition to the cavernous structure of the head-bones, and the absence of palatal teeth: exemplified by the Maigne and Umbrina of England. Of this restricted group, however, there is no Madeiran example. The only three Madeiran fishes which are referred to *Scianidae* in its wider sense by Cuvier and Valenciennes, will in the following pages be removed, one (Roncador) to *Percidae*, the other two (Castanhêta baia and Ferreiro) to *Chatodontidae*.

*Sparidae*:—The Spare or Sea-bream tribe.

Once seen, not easily to be confounded afterwards with others, from their peculiar physiognomy and habit. The form is considerably compressed, and generally deep; the mouth small, often furnished with teeth in front resembling the human, and round-headed grinders on the sides; there are none, however, on the palate; and both the opercles are unarmed, and with entire edges. The lips are fleshy, and the suborbitaries form a plain broad plate before the eyes. Their colours are generally silvery, with often richly iridescent rosy tints. Most of them inhabit the more temperate regions of the globe; and their flesh, though not of first-rate excellence, is generally good.

Examples:—The Gilt-head, Braize, Sea-bream, in England; and Sargo, Goraz, Pargo, Saléma, &c. in Madeira.

*Mœnidae*:—The Picarel or Smaris tribe.

A small group of fishes, included formerly amongst the *Sparidae*, but distinguished by the curiously protractile mouth, which, when opening, suddenly extends into a tube; as in the John Dory. Their form is more slender and elongated, or less deep, than in most of the *Sparidae*; and their colours are still more brilliantly and richly iridescent.

Example:—Bocairão or Boqueirão of Madeira.

*Chatodontidae*:—The Chætodon or Flag-fish tribe.

An extensive group of chiefly tropical fishes, small in size, but remarkable for the brilliancy, variety, and singular regularity of distribution of their colouring. Their shape is oval, short, and generally deep; always considerably compressed. The mouth is small, the whole head scaly, usually unarmed. Their principal characteristic is, however, the continuation of the scales over the base of, at least, the soft part of the dorsal and the anal fins, concealing more or less of the lower portions of their rays.



Hence the Cuvieran appellation of this family, “*Les Squammipennes*.” In many of these fishes, even in certain species of the genus *Chatodon* itself, the lateral line, as in *Glyphisodon* and *Heliastes*, cannot be traced beyond the termination of the dorsal fin.

Examples:—No English species. “*Castanhéta baia*,” and “*C. ferreira*” of Madeira, placed by Cuvier and Valenciennes at the end of *Sciænida*.

Passing over the nearly allied exotic family of *Osphromenida*,\* we arrive at a group rivalling, if not exceeding in extent, that even of the Perches: viz.

*Scombrida*:—The Mackerel tribe.

A well-known, and, within its proper limits, well-marked group, although not easily defined, because dependent upon a combination of characters in various proportions; not one of which, perhaps, but is occasionally liable to aberration. The principal of these, however, are the following. One of the most striking to the eye, and tolerably general, is a peculiar smoothness or apparent nakedness of body, owing to the smallness of the scales. The form is more or less elongated; the caudal fin is generally furnished with a keel or cuirassed ridge on each side of its base; it is strong and well forked, ensuring vigour or rapidity of movement; to which the absence of all protuberances, spines, or teeth about the head and edges of the opercles, joined with a peculiar compactness, simplicity, and closeness of packing observable about the latter, much contributes. The second dorsal fin is almost always elongated, generally high in front, and often separated into detached portions (called spurious fins or finlets) behind. The first dorsal fin is either short, or merely represented by a few short isolated spines without connecting web; sometimes it is entirely wanting. The anal fin corresponds with the second dorsal, and, like it, either has two or three detached free spines in front, or is separated into finlets behind.

The prevailing colour of these fishes is silvery-blue or steely, varied with different iridescent tints. Their flesh is much employed for food, but is generally somewhat dry and fibrous. Many of the species are gregarious; and almost all are endowed with great locomotive energies.

Examples:—Mackerel, Tunny, Sword-fish, Scabbard-fish, Pilot-fish, Scad or Horse-mackerel, &c. of England; Cavalla, Atum, Agulha, Espada, Tronbeta, Anchova, Chicharro, &c. of Madeira.

From these, the genus *Zeus* (John Dory) may be separated; typifying a family, *Zenida*, of which one striking character is a tendency to the developement of dermal bony plates, analogously to the mailed *Silurida*,

\* The celebrated Goramy tribe (“*Pharyngiens Labyrinthiformes*,” Cuv.); in form and outward characters closely resembling the *Chatodontida*, but differing in a curious internal apparatus connected with the gills; which is supposed, by fulfilling the office of a reservoir to these organs, to account for some remarkable peculiarities of habit in certain of these fishes; enabling them to leave the water, and to stray so far sometimes from its vicinity, that in India, as Cuvier relates, they are imagined to have fallen from the sky.

to the Sturgeons, and to certain Sharks and Rays. The singular genus *Oreosoma*, Cuv. seems also truly of this family. But of the other genera which have been commonly associated with *Zeus*, *Capros*, Lac. (the Boar-fish or Tem-te-em-pé of Madeira), is far more properly related, through *Enoplosus*, Lac. to the *Percidæ*; if it be not, indeed, rather the type of another distinct family, *Capridæ*: and *Equula*, Cuv. should certainly be placed in *Menidæ*, next to *Gerres*, Cuv.; whilst *Lampris*, Retz. and *Mene*, Lac. belong to the *Coryphænidæ*, another group, which ought to be detached from the *Scombridæ*, and of which the Dolphin or Dorado of sailors (*Coryphæna*, L.) is the type. These differ from the genuine *Scombridæ* in their greater or more conspicuous scaliness of body, and single elongated dorsal fin; the spines of which are either flexible and feeble, though not jointed as in the true Malacopterygians, or else are short and inconspicuous. The front or profile is peculiarly short, abrupt, and steep; the eye placed low, giving a certain obliquity of aspect. The sides of the tail are generally neither keeled nor cuirassed; there are no spurious finlets at the hinder end, and generally no free spines at the front of the dorsal or the anal fin. The genera which may be thus associated are *Coryphæna*, *Lampugus*, *Pompilus*, (*Centrolophus*, Lac.) *Seserinus*, *Stromateus*, *Peprilus*, Cuv. (*Rhombus*, Lac. and Val.) *Lampris*, *Mene*, *Brama*, Bl. (a genus of long doubtful and perplexed affinity, placed by Cuvier and Valenciennes at the end of *Chatodontidæ*), *Pteraclis*, *Asteroderma* (*Diana*, Risso), *Lurarus* (*Ausonia*, Risso); and perhaps *Apolectus* and *Kurtus*.

Examples:—The Black-fish and Ray's Bream of England; the Dou-rados, Delfin, Leiro or Liro,\* and Freira,† of Madeira.

Passing again over the tribe of the Riband-shaped fishes, (*Teniodæ*), of which there is no genuine Madeiran representative, and the equally exotic family of "Les Theutytes" (*Teuthidæ*) of Cuvier, we come to the

*Mugilidæ*:—The Grey Mullet tribe;

Characterized by their thick, almost cylindric form, large scales, ventral fins placed somewhat behind the pectoral, and very peculiar mouth or lips. They are fishes of remarkably active powers, and their flesh is universally esteemed. The Grey Mullet of England, and Tainha of Madeira, are examples. The species are all extremely alike, requiring much attention for their discrimination.

The Atherine or Sand-smelt of Southampton, Guelro of Madeira, "Le Prêtre" of the French, and other species of the genus *Atherina*, may probably be regarded as the types of a distinct family, *Atherinidæ*, rather than associated with the true *Mugilidæ*.

*Blennidæ*:—The Blenny or Goby tribe (*Lés Gobioides*, Cuv.).

A rather extensive family of small fishes, inhabiting generally rocky shores, or pools left by the tide amongst the rocks; characterized by their usually

\* *Pompilus* or *Leirus Bennettii*, nob. (*Centrolophus ovatus* and *crassus*, Cuv. and Val.)

† *Brama Raii*, Cuv. and Val. This seems to be its proper place; near *Pompilus* or *Centrolophus*.

smooth naked slimy bodies, and the weakness of their dorsal-fin spines. Most of them have various small appendages about the head, in the shape of little feelers, filaments, or crests; and are of dark or dull colours. Some have the ventral fins curiously united, so as to form a hollow cup resembling a limpet-shell (*Patella*); and more have them reduced to two or three thick fleshy rays, scarcely connected by a web.

Examples:—The Blennies, Gobies, Dragonets, in England; Cabozes, and Peixe Frades, in Madeira.

Of the very singular *Lophidæ* (Pectorales pediculées, Cuv.) or Fishing-frog tribe, at once distinguished by their pedicellate or stalked pectoral fins resembling hands, a single example only has occurred in Madeira, which constitutes a new species in the tropical genus *Chironectes*. In the market in Lisbon I have seen the curious fish (*Lophius piscatorius*, L.) in the greatest abundance of all sizes; but it is not known in Madeira.

*Labridæ*:—The Wrasse or Labrid tribe.

Another very distinct and tolerably extensive group in species, of generally small-sized shore or rock fishes; characterized by the singular variety and beauty of their colouring, small mouth, thick lips, projecting canine or tusklike teeth, oblong scaly body, and lengthened dorsal fin, which runs evenly along the back, and has the spines strong, and furnished with short fleshy filaments or appendages at their tips.

Examples:—The Wrasses or Old Wives; Peixe Verdes, Trutas, Peixe Cão, Bodião, Papagayo, &c. of Madeira.

*Fistularidæ*:—The Trumpet-fish or Sea-snipe tribe.

This small but very distinct family terminates the series of Acanthopterygian or Spine-finned fishes. It is at once known by the prolongation of its jaws or snout into a long straight slender bony tube, like a snipe's beak, but with an orifice at the end.

Examples:—The Trumpet-fish, Sea-snipe or Bellows-fish; Becasses de mer of the French; Soffietta of Italy.

## II. MALACOPTERYGIANS.

The second series of the true fishes, called Malacopterygians or Soft-finned, are distributed by Cuvier into three groups or orders, Abdominal, Pectoral, and Apodal, from the position or the absence of the ventral fins.

1. In the first of these, the Abdominal, the ventral fins are placed conspicuously behind the pectoral fins; as in the Carp, Gold-fish, Trout, Salmon, Pike, Herring, &c. Arenque, Sardinha, Lagarto of Madeira. It contains five principal families, embracing most of the fresh-water well-known fishes of Europe.

*Cyprinidæ*:—The Carp tribe or family.

This well-known tribe can scarcely require definition. The mouth is

small, jaws feeble, generally entirely without teeth; the branchial rays not numerous. Their body is scaly, generally somewhat slimy. They all inhabit fresh water, and feed chiefly upon vegetable substances or small mud insects, worms, &c.

Examples:—Carp, Gold-fish, Tench, Gudgeon, Barbel, Bream, Roach, Dace, Chub, Bleak, Minnow, Loach, &c. No Madeiran species, except the half-naturalized Gold-fish.

*Esocidæ*:—The Pike tribe.

Mouth or at least gape very large and long, well armed with often long and formidable teeth. Their body elongated, generally slender, covered with scales. Voracious fishes, fierce in their habits, and swift of motion, inhabiting the sea and fresh water.

Examples:—The Pike, Garfish or Sea-pike, Saury, Flying-fish, &c. Agulha and Avoador of Madeira.

Omitting the *Siluridæ*, a family of naked eel-like or curiously cuirassed fresh-water fishes, of which the Saluth of Switzerland, Wels or Scheid of Germany, a doubtful native of Britain, is an example, we arrive at the well-known family of the

*Salmonidæ*:—The Salmon tribe.

According to Cuvier, neatly or concisely characterized by the small rudimentary rayless fatty (adipose) second dorsal fin. The body is elongated and scaly; the mouth is large, well armed with teeth, which are found even on the tongue. They inhabit both the sea and fresh water; many of the species living indifferently in either for a portion of the year.

Examples:—Salmon, Trout, Char, Smelt, &c. and the Lagartos of Madeira.

*Clupeidæ*:—The Herring tribe.

Distinguished from the *Salmonidæ* somewhat artificially by Cuvier, on account merely of the absence of an adipose second dorsal fin. This character ought probably to be employed less absolutely in regard to both these families, which seem to require considerable remodelling. The edge of the belly is generally keeled, and serrate like a saw. The mouth is small, and feebly armed with minute teeth.

Examples:—Herring, Pilchard, Sprat, Whitebait, Shad, Anchovy, &c. and Arenque, Sardinha, of Madeira.

2. The second order of the Malacopterygious or Soft-finned fishes is characterized by the forward position of the ventral fins upon the throat, before or beneath the pectoral fins or branchial (gill) openings; hence called Subbrachian or Pectoral Malacopterygians. It contains the large and important family of the

*Gadidæ*:—The Cod-fish tribe.

The body is elongated, and covered with rather soft small scales, the



head being large and naked; the fins peculiarly soft and fatty, generally two or three in number, or one extending all along the back. The mouth or gape is large and wide; the teeth small. Their flesh is tender, white, and delicate, affording an abundant aliment to man. Except the Burbot or Birdbolt (*Lota vulgaris*, Cuv. *Gadus Lota*, L.), all are inhabitants of the sea, and chiefly abound in the cold or temperate regions of the globe.

Examples:—Cod, Haddock, Whiting, Hake, Ling, Burbot, Torsk, &c. and in Madeira the Abrotea, Pescada, Praga, &c.

*Pleuronectidæ*:—The Sole or Flat-fish tribe.

Universally known by their singular flattening on one side; by which the eye, and bones of the mouth and head, are, as it were, squeezed up or over to the other side. Hence the tail or caudal fin is not really, but only apparently horizontal, from the habitual posture of the fish on one side, (*πλευρά*, the side, and *νηπτής*, a swimmer,) which is the plain uncoloured one; forming no real exception to its characteristic vertical condition in the fishes.

Examples:—Flounder, Plaice, Sole, Turbot, Holibut, &c. Sola of Madeira.

*Cyclopteridæ*:—The Sucking-fish tribe.

A small family of singular fishes, analogous\* to the spiny-finned *Gobidæ*; having the same naked slimy skin, and the ventral fins united into a curious disk or sucker underneath the belly, by which they adhere strongly to other bodies.

Examples:—The Lump-sucker or Cock-paddle of Scotland; Chupa-sangue of Madeira.

*Echeneidæ*:—The Remora tribe.

This family consists, at present, only of a single genus, which refuses to be classed with any other, and is characterized by the disk affixed to the top of the head, by which these curious fishes adhere to others for the most part of considerable size and locomotive energies. To these their parasitic habits they are indebted chiefly for their own transference from place to place; being themselves endowed with feeble or awkward swimming powers.

The body is elongated, clothed with minute or inconspicuous scales, and slimy. The head is flattened; mouth large, well-armed with copious but small teeth. The colours are dark, and generally uniform.

Examples:—The supposed Remora of the ancients; the Pegadores of Madeira.

\* Perhaps the relation is one of affinity, and much closer. At least, *Lepadogaster* might well be united with the *Gobidæ*.

(3.) The third and last order of the soft-finned fishes, which also closes the whole series, is characterized by the absence altogether of the ventral fins. Hence it is called Apodal (from  $\alpha$ , *without*, and  $\pi\omicron\delta\acute{\epsilon}\varsigma$ ,  $\pi\omicron\delta\delta\acute{\epsilon}\varsigma$ , *a foot*). It scarcely contains more than a single family, the

*Murænidae* :—or Eel tribe.

Well known by their elongated snake-like form; smooth, slippery, and slimy skin, in which the minute scales are so imbedded as to be imperceptible till dried.

Examples :—Eel, Conger-eel, Muræna, Morris, Sand-eel, and Sand-lance of England; Eiro, Congro, Morcia, &c. of Madeira.

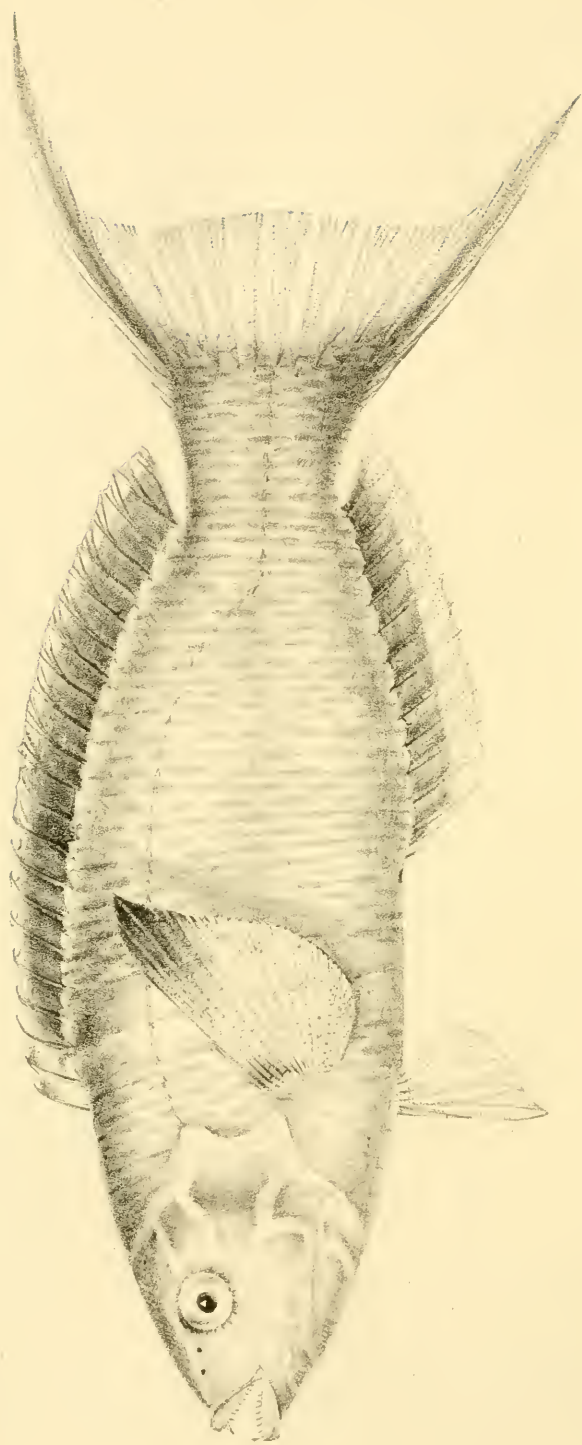
Funchal, Madeira, April 25th, 1839.

Explanation of the Plate illustrative of the Anatomy and Osteology of Fishes. N. B.—The figures I. and II. are of the common Perch, after MM. Cuvier and Valenciennes: figures IV. and V. are taken from an individual of *Beryx decadactylus*, Cuv. The numbers and letters of reference, for the most part, correspond with those used by MM. Cuvier and Valenciennes in the first volume of the *Histoire des Poissons*, and in their accompanying anatomical plates.

No.	Fig. I.	Figs. II. and V.
17.	Intermaxillary.	A. Œsophagus.
18.	Maxillary.	B. Stomach.
19.	First suborbitary.	C. Pylorus.
30.	Pre-opercle.	D. Cæca.
33.	Inter-opercle.	E. Intestine.
28.	Opercle.	F. Branchial arches.
32.	Sub-opercle.	N. Gall-bladder.
46.	Superscapulary.	
47.	Scapulary.	
48.	Humeral.	
51.	Cubital.	
52.	Radial.	Fig. III.
53.	Carpal.	No.
43.	Branchial or branchiostegous rays.	61. Vomer.
67.	Last abdominal vertebra.	22. Palatines.
68.	First two caudal vertebrae.*	
74.	Interspinals.	
d.	Dorsal fin.	Fig. IV.
a.	Anal —.	No.
p.	Pectoral —.	56. Lower pharyngeal plates.
v.	Ventral —.	62. Upper ———.
c.	Caudal —.	

\* In the common Perch, according to MM. Cuvier and Valenciennes, there are forty-two vertebrae, viz. twenty-one abdominal, and twenty-one caudal.





*T. 1. M. Y. del & Sc*

## TAB. I.

## JULIS TURCICA, RISSO, VAR. α. NOB.

*Peixe verde.*

BLUE-COLLARED GREEN-FISH OR SWALLOW-TAILED WRASSE.

## CHAR. GEN.

Corpus oblongum; capite operculisque integris inermibus, nudis. Linea lateralis postice abrupte deflexa.

*Obs.*—Pisces parvi, littorales s. rupestres, coloribus pulcherrimis variantes, vix edules.

## CHAR. SPEC.

*J. ovali-oblonga*: corpore viridi, lituris rufis creberrimis perpendiculate seriatis torqueque humerali cœrulea viridive rubro fere marginata distincto; capite lateritio, fasciis cœruleis rivulosis anastomosantibus picto: pinnis pectoralibus apice nigricantibus; dorsali antice miniato notata analique purpureo fasciatis, basi vaginato-squamatis; caudali forcipata, lobis productis, purpureo vittatis: operculo postice biangulato: squamis magnis.

$$D. 8 + 13; A. 3 + 11; P. 2 + 13; V. 1 + 5; C. \frac{2 v. 3 + VI.}{2 v. 3 + VI.}$$

M. B. 6; Squamæ lineæ lateralis 23; Vertebrae 9 abdominales + 16 caudales = 25.

*J. turcica* (Risso), Cuv. R. Anim. Ed. 2<sup>da</sup>, ii. 253.

*J. pavo*, Cuv. et Val. (*Labrus pavo*, Hasselq.; *L. syriacus*, Bl.; *L. hebraeus*, Risso, Ichthyol.) Hist. XIII. 377, partim.\*

*Labrus pavo*, Linn. Syst. Ed. 12<sup>ma</sup>. l. 474. n<sup>o</sup>. 3, partim.

Var. α. *torquata*: corpore efasciato, s. toto rufo liturato.

*J. turcica*, Risso, Hist. Nat. iii. 312. n<sup>o</sup>. 212. f. 21.

*J. pavo*, Cuv. et Val. l. c. t. 336.

*Labrus lunaris* vel *Peixe verde*, Sol. MSS. cum iconē: (excl. var.)

Tab. nost. l.

Vulgaris.

Var. β. *lemniscata*: lateribus viridi fasciatis; fasciis perpendiculatis, angustis.

Rariss.

*Longitudo*, 6-7 pollicaris, æquat altitudini quater multiplicatae = 4 × alt.

*Tempus*, per totum annum.

*Locus*, littoralis, rupestris.

\* This species is here understood in a narrower sense than by MM. Cuvier and Valenciennes, who appear to have included in it one distinct fish at least, *J. unimaculata*, nob.; and have not clearly separated the varieties. The name *Julis pavo* must, at any rate, give way before the prior claim of that affixed by Risso, and adopted by Cuvier in the Règne Animal, for the commonest or typical variety. The synonyms of Hasselquist and others are excluded from all competition; the fish not being now included in the genus *Labrus*, and the question of precedence being limited by the generic name. *Labrus pavo*, L. is a mixture of the present fish with the already confused "*Labrus pulchre varius*," &c. of Artedi: itself become a medley in his *Synonymia*, of Willughby's "*Turdus perbelle pictus*" (*Labrus mixtus*, Cuv. et Val.), and of Salviani's "*Pavo*" (*Crenilabrus pavo*, Cuv. et Val.). Solander's "*Varietas: cum macula nigra in medio prope basin pinnæ dorsalis*" is *Julis unimaculata*, nob.



THE Labrid tribe, or family, forms a conspicuous and well-marked group of fishes. The points which constitute their family resemblance are a generally oblong, not deep, form of body, furnished with rather large, but smooth and slimy scales; thick fleshy lips; teeth generally conical, projecting, tusk-like; small, unarmed head; and a single, long and even, dorsal and anal fin, the spines of which are generally tipped with a fleshy filament. Internally, the pylorus is usually unfurnished with cæca, or has only two very small ones; and the air-bladder, although large, is simple. To these distinctions may be added a brilliancy and variety of colouring almost unrivalled.

The species of this family, indeed, might not be inaptly styled, the Humming-Birds of ocean. A general uniformity of habit, form, and structure, is compensated by an endless diversity and brilliancy of colour; vying in richness, harmony, and brightness with those "jewels of the air," as the members of the feathered tribe just mentioned have been poetically called; and combining the dazzling brilliancy of the sapphire or turquoise, ruby or coral, topaz, amethyst and emerald, with the pure harmony and blending softness of the rainbow.

These remote analogies between collective tribes, or individual species of one department of the organized creation and another, are highly curious and interesting. They are not mere flights of fancy or imagination; but, like those mysterious harmonic sympathies in music or acoustics, which engage the soul whilst they enchant the sense, hint to us, as it were, from every side, the master-chord of one Great Centre of creative influence, which stirs, and sways, and rules, like consentaneous vibrations through the whole range of nature; and speak, as from one part of the creation to another, of Him who worketh all in all.

The present species, striking as it is in beauty, seems to have been unknown to all the older ichthyologists: though it may possibly be alluded to collectively with others, in the following line, taken from the elegant little fragment usually attributed to Ovid,

"Tum viridis squamis parvo Saxatilis ore."

Halieut. 109.

It is, indeed, a native generally of the Mediterranean in one or other of its forms; though Risso is the only modern writer who has given a distinct original description of the precise variety here figured, from individuals inhabiting the sea of Nice. In this its normal state it is, however, in Madeira only less common than a very similar and cognate species, liable to be confounded with it (*J. unimaculata*, nob.\*) which absolutely swarms in shoals, close off the rocky shores

\* *J. unimaculata*, nob.

*J. subgracilis*, elliptica, utrinque subattenuata: corpore fulvo-castaneo, virescente, lituris rufis creberrimis perpendiculate seriatis, fasciæque longitudinali media diffusa obscura ab oculis utrinque ducta; dorso ad medium basin pinnae dorsalis unimaculato: capite lateritio, fasciis cæruleis rivulosis anastomosantibus picto: pinnis pectoralibus apice nigricantibus; dorsali analique purpureo-fasciatis, basi

and headlands of the southern coast. It does not owe its peculiarity of colour to the seasons; for I have notes of individuals taken during all, both in association with the other variety and with *J. unimaculata*.

The food of all these fishes seems to be the smaller Shell-fish, Crustacea, and Mollusks. Like their associate, *J. unimaculata*, they are captured with the greatest ease; biting as quickly and as greedily as Perch or Gudgeons at a hook, which their narrow mouth or gape requires to be small, baited with a crushed periwinkle (*Littorina vulgaris*, Fer; *Trochus edulis*, nob. or *Tr. maderensis*, nob.) They are not usually themselves employed as food: but their beauty and variety of colouring render their capture an amusement of some interest.

The general form of *J. turcica* is compressed, more oblong than elliptic, and deeper than usual in the genus; the depth, which is greatest in the middle, being one-fourth of the entire length to the tips of the forks of the caudal fin: in this particular it approaches the *Crenilabri*. The greatest breadth or thickness is less than half the depth. The head is pointed; the curvature of the profile downwards, from the origin of the dorsal fin, is regular and gradual; and it is equal and symmetric with that of the throat upwards, from the base of the ventral fins. The length of the head, from the tip of the closed jaws to the extreme hinder angle of the opercle, is equal to the greatest depth of the body: its height, in a vertical line passing through the centre of the pupil, is equal to three-fifths of its length. The eye is round and rather small; its diameter is contained five and a half times in the length of the head. It is placed high up the cheeks, at the distance of half its own diameter from the top of the head, and that of two diameters from the outline of the throat below: whilst the distance from its anterior canthus to the tip of the muzzle is something less than twice its own diameter. The nostrils are two small simple holes, placed one before the other, in a line from the upper edge of the eye to the tip of the muzzle: the foremost being halfway. There are no prominent bones, ridges, or sculpture of any sort, about the head or cheeks, which are quite plain and flat; and the line of the pre-opercle itself is scarcely visible; the whole being covered with a perfectly smooth and even skin, free both from scales and pores. The opercle ends posteriorly in two salient membranous flat points or angles, separated by a sinus: the lower is the most prominent, corresponding with the upper axil of the pectoral fin.

The mouth and gape are small, the latter reaching only halfway backwards towards the eye. The lips are fleshy and distinct.

In either jaw is an outer row of from eighteen to twenty conic pointed teeth, increasing in size forwards; the front pair largest and approximate: all pointing forwards, but more and more projecting towards the front, where they are also doubled by an internal row of five or six smaller ones. There is no large tooth, or tusk, at the corners of the mouth behind, in this species. The teeth are often very irregular, from loss or accident, in old or adult individuals.

The whole body is extremely viscous or slimy, and covered with large smooth scales, overlapping or sheathing the base of the dorsal and anal fins, and running up between the outer rays only of the caudal fin. When dry, their exposed part appears finely and regularly striate longitudinally in parallel lines. The lateral

vaginato-squamatis; caudali lunata, lobis abbreviatis, purpureo vittatis: operculo postice biangulato: squamis magnis.

D. 8 + 13, &c. ut in *J. turcica*.

*α. tæniata*: lateribus viridi-fasciatis: fasciis perpendiculatis, angustis.

Vulgatiss.

*β. lineolata*: fasciis nullis.

Rariss.

line follows at first the curvature of the back ; rising a little at its origin, and keeping near the dorsal line, high up the sides. After descending again at the end of the dorsal fin, it makes an abrupt flexure or elbow, and is continued from this angle in a straight line along the middle. It is rather obscure throughout its whole course ; appearing formed by raised adpressed spine-like points upon the scales.

The dorsal fin begins in a vertical line above the upper axil of the pectoral fins or point of the opercle, and continues, gradually and regularly becoming rather broader, to within a short distance of the base of the caudal fin. Its whole extent equals about half the length of the entire fish ; and its height is about one quarter of the depth of the body.

The anal fin commences about the middle point of the body, not reckoning the caudal fin ; or opposite the end of the first third part of the length of the dorsal fin ; to which in shape and breadth and termination it exactly corresponds. The last ray of each is also forked to the base.

Pectoral fins ovate, rather large and broad, obtuse. Ventral fins ovate, subtriangular ; placed beneath, but a little before the pectoral fins ; small, free, and without any pointed scale either at their upper (outer) or inferior (inner) axil.

Caudal fin with the outer rays both above and beneath produced into two slender, almost filamentous points : the intermediate portion slightly convex in the middle. The upper fork is the longest.

The general colour of the body in a fine-conditioned state of this variety, such as that here figured, of *Peixe verde*, is the brightest grass-green, resplendent as it were with gold and emeralds ; and each of the scales, except upon the collar, which is plain, is marked with a vertical oblong spot, dash, or stain, of dull red, forming regular and close-set rows or lines from the back down to the belly, which is bluish, or occasionally deep blue, and unspotted. A broad obliquely disposed collar of the richest turquoise-blue surrounds the shoulders just behind the pectoral fins ; bordered, especially behind, with a secondary band or collar of most brilliant coral-red, the hinder edge of which in finely coloured individuals, melts through the richest hues of orange, yellow, and citron, into the prevailing golden-green tint of the body. Another plain but always narrow stripe of brilliant blue or green rises from the fore-axil of the pectoral fins ; running immediately behind the edge or border of the opercle, and ascending towards, but not attaining the nape, which is of a fuller and plainer green than the rest of the body : the spots upon its scales becoming, like the stripe just mentioned upwards, more or less evanescent. The head is most beautifully banded with deep turquoise-blue, waved or zigzag, narrow stripes, which cross or interlace in different directions, on a dull red ground of varying intensity suffused with brighter pink. The same deep blue colours the base and edges of the dorsal and anal fins, tinges the iris, lips, throat, belly, and ventral fins ; and is the prevailing colour of the caudal fin : but sometimes all these parts except the caudal fin are emerald-green ; and, indeed, generally the first ray and edge of the fore part of the dorsal fin in front of its red stain or patch are green. The dull red ground-colour of the head is heightened on its sides into a deeper suffused patch or band, extending from the eye over the opercle to the fore-axil of the pectoral fins, but not perceptible beyond. The iris is either green or blue, with the inner and sometimes outer edges orange, red, or golden. A broad band of rich violet or dark purple runs along the middle of the dorsal, anal, and forks of the caudal fins : beginning in front of the dorsal in a clear bright coral-red stain, spot, or patch, not very well defined, and spreading more or less over the web of its two or three first rays ; but not extending backward than the blue part of the collar, above which, rather than over the red part of the same, it principally lies. This patch is always of a full and brilliant tint. The outer edges, and the

whole middle of the caudal fin, both rays and web, are blue. The pectoral fins are pellucid, black at the *tip*, not as described by Risso, at the base; which has a transverse stain or ill-defined band of blue or green, above a somewhat more distinct one on its fleshy part or pedicle of orange or dull red.

In other and more ordinary individuals, the red band behind the blue collar on the shoulders is dull or lateritious red, like the ground-colour of the head; and unaccompanied by any yellow on its hinder edge: and the bands of the dorsal, anal, and forks of the caudal fin are lateritious also. The collar varies much in breadth, and is even sometimes green; but still becoming bluish towards the belly. Other slight differences occur, especially in the brightness of the tints: but in no case can the pencil give a proper notion of their brilliancy and splendour.

The variety  $\beta$  is taken very rarely, but in association indiscriminately with  $\alpha$ : from which it only differs in having the sides banded vertically, more or less distinctly, with four or five narrow distant plain green stripes, caused by the absence of the dashes on the scales. The first of these bands, when there are five, is close behind the blue or green and red collar; in front of which is also the usual narrow blue or green stripe rising towards the nape from the axil of the pectoral fins, and forming in this case with the collar, which is generally not wider than the bands behind it, a seventh vertical stripe or band. The last of these is at the hinder end of the dorsal fin.

A single individual has occurred of both varieties, in which the collar was entirely wanting: yet had they all the other proper characteristic marks of *J. turcica*; viz. the more oblong shape, the more produced lobes of the caudal fin, and the bright red spot at the origin of the dorsal fin; being also without the dusky spot in the middle of the dorsal fin: whilst with *J. unimaculata* they agreed only in this absence of a collar; one of them alone indicating a nearer approximation to the same in the barely traceable approach, by a heightening of the tile-red dashes on the scales, to a darker longitudinal stripe along the middle of the sides; the five vertical bands of which, however, were but faintly perceptible. In the other there was neither stripe nor bands. Here, therefore, is no more of ambiguity than might reasonably be expected to occur between two closely allied species, similar in size and habits, and mingling promiscuously in shoals; amongst which accidental hybrids must continually arise. I do not think that the rare and occasional existence of such individuals at all invalidates the specific difference of *J. turcica* and *J. unimaculata*; but the contrary.

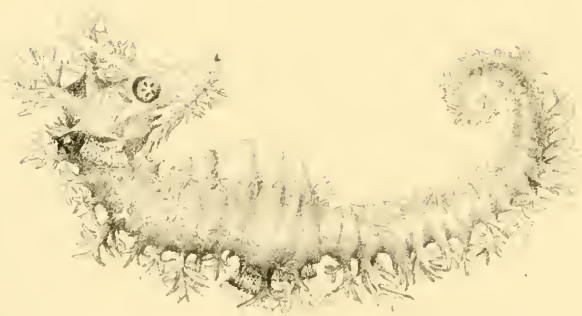
It may be worth remarking, that whilst, as it is well known, in the rainbow or prismatic spectrum, the sequence of the three pure or unmixed colours is Blue, Yellow, Red, their order in the collar of this fish is Blue, Red, Yellow.

The figure is the size of life.









## TAB. II.

## HIPPOCAMPUS RAMULOSUS, LEACH.

*Cavallo marinko.*

## THE STAG-HORNED HORSE-FISH OR HIPPOCAMPUS.

## CHAR. GEN.

*Corpus* compressum, cauda abrupte altius, cataphractum, scutato-areolatum, costato-cancellatum ; angulis tuberculatis. *Cauda* distincta, incurva ; apice simplici, nuda. *Caput* abrupte deflexum. *Pinna ventralis caudalisque* nulla.

*Obs.*—Pisces minores, aspectu monstroso, mirifico ; capite cum corpore caput cum cervice equinum referente ; indole pigriore, tardi ; ægre libere natantes, sed ima petentes, cauda prehensili capiteque inter algas zoophytasque rupesque scandentes.

## CHAR. SPEC.

H. livido-carneus, scaber : nucha dorsoque caudaque duplici serie frondoso-jubatis : corporis angulis lateralibus palmato-frondiferis : capite frondibus magnis, distinctis ornato ; duobus superciliaribus, occipitalibusque duobus ; uno frontali, unoque temporali utrinque : rostro brevi, utrinque frondoso-ciliato.

D. 17 ; A. 4 ; P. 15.

*H. ramulosus*, Leach, Zool. Misc. I. 105. t. 47.—Syn. Mad. Fishes, in Trans. Zool. Soc. p. 192.

*H. rosaceus*, Risso, Hist. iii. 184. no. 68 ?

*Longit.* (exempli unici) = 5 poll. = 5 × longit. capitis.

*Tempus*, autumno (Augusto).

*Locus*, prope littus, saxosis. rariss.

THE singular little animals which constitute the genus *Hippocampus* have long attracted the attention of the curious. In the Mediterranean they seem not to be uncommon ; and, retaining by simple drying all the character and form of life, most Neapolitan collections include an individual of one or other of the species, resembling more some artificial whim of ingenuity or trick than a real natural production. Indeed, even in the eyes of the experienced ichthyologist, they bear little external likeness to the tribe of fishes ; with which, by internal anatomy and real structure, they are, however, properly associated.

A modern discovery has proved the *Syngnathidæ* to be no less anomalous in certain of their habits than in their form. It had long been known to naturalists\* that the eggs, after extrusion, were carried about by the

\* Aristotle and both his copyists, Ælian and Pliny, of the ancients ; see Ælian, lib. ix. cap. 60, and xv. 16 : and for modern authorities, see Rondel. 229, and Schneider's Excurs. 3, " De acu marina seu βελώνη," in Ælian. p. 575.

animal within a lengthened cleft or groove, formed in a ridge or prominence along the tail beneath; and it had naturally been assumed that this was the office of the *female* fish.\* It has, however, been clearly ascertained, in certain species of the closely allied genus *Syngnathus*, the Pipe-fishes of our English coasts, that the *male* fish is the careful egg-bearer and the hatcher of his future progeny. This curious fact was first, in Britain, noticed by the late John Walcott, Esq. author of several works on natural history; but remained unknown in his unpublished MSS. till recently brought forward and confirmed by Mr. Yarrell.† On the Continent it seems in like manner to have escaped general attention, though said to have been noticed by Eckström, Retzius, and Marcklin; and more lately by Agassiz.‡ Positive observations are indeed still wanting to connect these curious habits with the *Hippocampi*; but their close alliance with the Pipe-fishes in structure makes agreement more than probable, it being actually ascertained in certain *Hippocampi* that the ventral pouch is only present in the male.§

Little has been hitherto recorded of the other habits of the *Hippocampi*. The observations of Mr. Lukis in "The British Fishes," regarding those of movement in *H. brevisrostris*, Cuv. confirmed by those hereafter to be mentioned of the subject of this Chapter, show a considerable deviation from the usually abrupt and rapid motions of the ordinary fishes. This peculiarity may be connected with the absence of a caudal fin; and it would be interesting to inquire whether a similar sluggishness of motion prevails amongst that tail-less section or subgenus of *Syngnathus*, termed by Risso *Scyphius*; to which belong the British species *Syngnathus aquoreus*, L. *S. ophidion*, Bl. and *S. lumbriciformis*, Jen. in contrast with the true *Syngnathi* (*S. Acus*, *Typhle*, L. &c.) which are provided with a caudal fin.

Not only in some points of structure, form, and colour, therefore, but in habits, do the *Syngnathidæ* seem to bear a remarkable analogy among the fishes to the terrestrial reptiles; the *Syngnathi* are the more active kinds of Snake or Lizard; the *Hippocampi*, and perhaps the *Scyphii*, represent the tardigrade Chamæleon, or the sluggish Blindworm (*Anguis fragilis*, L.): whilst in all these fishes there is an evident approximation to the more directly viviparous habits which prevail in certain reptiles.

The chief distinctive characters of the family consist in the loricate or cuirassed structure of the skin; which is smooth, but divided into four-sided compartments, like a coat of mail, and in the nature of the branchiæ; which, instead of exhibiting the usual pectinated structure, are collected into little distinct crests (λόφοι) or tufts, arranged in pairs along the branchial arches. These fishes have no *cæca*, but a large air-bladder.

\* See Linn. Ed. 12. i. 417, note.

† See British Fishes, ii. 327—329; and Proc. Zool. Soc. iii. 1835, p. 183.

‡ See Proceed. Zool. Soc. ii. 1834, p. 118.

§ See Yarr. Brit. Fishes, ii. 345.

Their form is generally slender, with an elongated tail; which, in the *Hippocampi*, is inflexed, curled inwards, and prehensile.

They are generally of small size, and they have scarcely any fleshy muscle: whence they are nowhere used for food. From the tubular form of the mouth, their own nourishment is probably much of the same kind in all the species; such as in certain *Syngnathi* it has been discovered to be, small marine animals, mollusca, worms, and eggs of fishes. These are drawn up into the throat by suction, probably by dilatation of the gullet.

The anomalous structure of the branchiæ and outer integument indicates a departure from the true fishes; such as their general form and aspect forcibly suggest. The bony fibrous skeleton retains, however, like the rest of the internal anatomy, all the essential characters of the true fishes. The tribe of *Lophobranchiæ*, or Crest-gilled fishes, therefore, is well placed by Cuvier as an aberrant group, by which he passes from the true fishes to the still more anomalous Diodons, Balistæ, Ostracions, &c. to which, in the nature of their skin and singularity of form, they bear a near affinity.

The *Hippocampi* in these points, and in the produced muzzle, also bear a sort of miniature resemblance to the Sturgeon; of which they might be conceived, if seen only when preserved, to be some dried distorted form. It is, however, an error to attribute either the curled-up tail, or head bent downwards so abruptly with the body, to contraction after death. The tail is constantly incurved, and usually employed in a prehensile manner for an anchor during life; while the head is used in climbing as a stay or hook to raise the body, and is quite immoveably bent down.

In point of rarity, no less than elegance, *H. ramulosus*, Leach, is the most interesting of its genus. An individual of unknown origin, existing in the British Museum, has been long since imperfectly described and figured by Leach,—from a discoloured and probably dried specimen. By Willughby this species appears also earlier to have been observed; though he does not separate it from the common sort described by him, *H. brevirostris*, Cuv. The following passage cannot but refer to *H. ramulosus*, Leach, rather than to the former:—

“Vidimus Venetiis hujus generis jubatum, nescimus an specie diversum, an ætate aut sexu tantum. Plerique enim juba carent, quantumvis *Rondeletius* pilos in capitis vertice erectos omnibus tribuere videatur. Erat autem jubatus ille quem *Venetiis* nacti sumus non jubatis quadruplo fere major. In medio ventris pinnulam seu membranam nigricantem observavimus; ab omnibus in summo capite et cervicæ majoribus eminentiis angularibus seu aculeis villi seu setæ longæ dependebant jubæ instar, non adeo tenues, (ut scribit *Rondeletius*,) ut non in mortuis et exsiccatis sed in viventibus tantum appareant, verum crassiusculæ et facile conspicuæ.”—Will. Hist. Pisc. p. 158.



Whatever doubt may therefore be attached to Risso's synonym, the present species may be assumed, with tolerable certainty, to exist also in the Mediterranean. In Madeira it is of excessive rarity; a single female individual only having occurred, which was brought alive and in full vigour by a fisherman, as a great curiosity, on the 17th of August 1836. It had been taken entangled in his net or lines, about five hundred yards off the Loo Rock, or Ilhéu; and lived in a glass of sea-water, after its capture, more than twelve hours, affording ample opportunity for the accompanying record of its form and habits.

The shape or contour of the head, and comparative proportion of the snout, differ in no respect from *H. brevirostris*, Cuv.; the main characteristics of the species consisting in the size, number, and position of the crowded, much-branched, bush-like tufts of *ciliæ*, or filaments; which give the animal the appearance of being enveloped in a mass of some delicate gelatinous sea-weed, or conferva (*Draparnaldia* or *Ceramium*). These float freely and loosely while the animal remains immersed in water, but collapse into a shapeless jelly-like mass when it is taken out of it. They are largest on the head, and thickest-set all down the dorsal ridges; along which they form a sort of upright mane, continued from the head almost to the tip of the tail, with the exception of a short interruption from the dorsal fin. The branches are short, thick, and blunt at their tips.

The head is compressed, equalling one fifth of the entire length, measuring from the tip of the snout to that of the tail, or one fourth of that of the body without the head. It is bent down at an acute angle with the short neck, which is itself abruptly curved nearly at right angles with the rest of the body. The snout is short, measuring from the fore-corner, or anterior *canthus* of the eye, about two fifths of the length of the head. It is fringed on each side with a row of three or four short branched *ciliæ*, and has two shorter triangular compressed ones, placed one behind the other at its base, in the front or middle, just before the eyes. Of these the hinder is the largest, and is placed upon a bony tubercle. Eyes very prominent, perfectly circular, their diameter equal to one third the length of the snout, measured as above; each, as in the *Chamæleon*, moving freely or independently of the other.\* Close over each eye is a prominent bony tubercle, out of which grows, concealing its existence to the eye, a single, large, tree-like antler, with a distinct thick stem, directed vertically upwards, and in length or height exceeding the distance from the tip of the snout to its base. Its branches are somewhat blunt, and thick and short; divaricate, or dividing at wide open angles; the pair resembling much in size, direction, and proportion, the antlers of a stag, except in being of a fleshy, soft, or flaccid substance, and quite flexible. Front or forehead flat, high, and narrow: in its middle, halfway above the superciliary pair and the top of the head, or occipital crest, stands another solitary antler, of equal size, and otherwise resembling the former, but directed straight forwards, like the horn in the common representations of a Unicorn; so that its branches fall between those of the pair above the eyes. On each temple, and in a line with this single frontal antler, but on the sides of the head, is another solitary antler of equal size, like shape and substance, with the former,

\* Mr. Couch has observed the same curious fact in a very different fish, *Pholis lævis*, Flem. See Cuv. and Val. xi. p. 274. Mr. Lukis has observed it also in the common *Hippocampus brevirostris*, Cuv. See Yarr. Brit. Fishes, ii. 344.

standing straight out at right angles with the sides of the head. Again, on the complicated bony occipital crest, or pair of tubercles, is placed another pair of antlers, precisely like the former; their stems forked or divaricating laterally upwards, but adnate and confluent at the base: their branches erect, and blended or confused to the eye into a single tuft by the presence of smaller shorter ones placed on the other tubercles or bony prominences behind them on the nape or neck. Opercle plain, even, or not, at least whilst recent, obviously striate; furnished with one or two small tufts or *cilicæ*, and sprinkled with white granules. The branchial openings are two round holes or orifices, placed close together high up, almost on the nape.

Neck compressed, short, arched. Body compressed, heptangular, narrow upwards; the belly downwards very prominent; from the nape to the origin of the tail banded by eleven circular or transverse ridges, crossing at right angles the seven more distinct and prominent longitudinal ones, which rise into bony tubercles at their intersection with the former. Of these seven, two are dorsal, two on each side lateral, and one ventral, forming the outline of the belly. The two dorsal ridges are most prominent, approximate, with the space between them hollowed into a narrow groove or channel; and on each intersection with the transverse ridges, stands a branched tuft or *cilia*, smaller, but otherwise resembling those on the head, and forming a thick mane all the way from the head, or occiput, to the dorsal fin. The two side ridges are similarly furnished; but the tufts are much smaller, irregularly palmate, and quite distinct or separate from each other, the ridges themselves being remote; the uppermost is nearest the back. The seventh abdominal or ventral ridge is naked.

Tail abruptly contracted to half the depth only of the body, quadrangular, sub-compressed; the sides slightly convex, and deeper than the dorsal, or even the ventral faces, which are both channelled or hollow; the dorsal channel being close and narrow; the ventral wide and open: its tip curled in, obtuse; with about thirty-five transverse rings or ridges, each giving off at its angle of intersection with the two dorsal angles, a palmate rather than tufted *cilia*, on a stout, thick, fleshy stalk or pedicle, forming a thick fringe or mane, in continuation of that of the body, reaching from its origin nearly to the tip; the *ciliæ* becoming gradually shorter or smaller towards the latter. A few of the anterior rings or angles only of the two ventral ridges are produced into irregular, abortive, small, palmate *ciliæ*, for a little way from nearly the base of the tail; the two first rings being naked.

The whole surface of the head, body, and sides of the tail, is rough, with minute raised points or granulations, approaching to the form of short simple *ciliæ*.

Dorsal fin curvilinearly oblong, about twice and a-half as long as high, even, of equal breadth or height, placed just at the hinder end of the body, on a sort of raised hump or ridge at the bottom of the back. Anal fin minute, fan or rather wedge-shaped, placed just at the lower angle of the belly, at the origin or base of the tail. Pectoral fins oblong, seated at the origin of the neck, close behind the hinder edge of the opercle; the line of their base is vertical or transverse to the neck, as in most fishes, and longer than the fin is broad or deep: it is thickened or raised, forming a kind of pedestal to the fin.

The general tint is a dull flesh-colour; the cheeks or opercles, tip of the snout, space just before the eyes, and under parts, are paler and brighter than the rest, or whitish; the sides of the body mottled, or varied here and there with lilac or livid-blue. The tail and all the branched *ciliæ* are brighter, clearer, and more uniform flesh-colour. Through the lens, the sides appear most beautifully speckled thickly with minute minaceous or orange dots on a livid-blue ground; and the whole surface of the head and body, especially that of the snout and opercles, is spangled

with pure opaque-white scattered dots or points, like spinules or incipient *ciliæ*. The eyes are like some brilliant jewel set in mosaic. The iris, as in the Chamæleon, is most beautifully painted with alternate rays or tessellated bars of glittering garnet-red and dazzling white on the inner edge next the pupil; the circumference being thickly studded with the brightest pure white dots, which to the eye resemble most distinctly raised granules or short *ciliæ*, like those which are sprinkled on the snout and elsewhere. The pupil is black; but reflects in rapidly succeeding variation, as it moves, most brilliant topaz, straw-colour, or brassy tints, in different lights.

The dorsal fin is like the rest pellucid, and pale olive; reddish at the base, and there speckled with white: it has a deep black patch in front, upon the two or three first rays; not reaching to their tip, but leaving a border, about one third of the fin deep, which is traced out by a black or dusky line, continued backwards to the end from the front spot, and stained in front with bright clear yellow. The other fins are pellucid, nearly colourless, immaculate.

The branched tufts or *ciliæ*, and even the surface of the body, were thickly clothed with a short, brown, filamentous, down-like substance, which was, perhaps, some parasitic *Infusoria* or *Conferva*.

Placed in a basin of sea-water, the depth of which did not allow it to attain a vertical position, it showed evident symptoms of uneasiness. It was continually swinging its body slowly round, as if to seek support; using the tail merely as a vague unsteady sort of fulcrum, and making all the time of each sweep a rapid fluttering or vibratory motion with the pectoral and dorsal fins. Removed into sufficient depth of water in a tumbler, it assumed at once a vertical position; but appeared unable to maintain it, except by slowly moving round continually, and quivering the fins; sinking down horizontally when not so occupied. A piece of stick being placed upright in the water, it instantly coiled the end of its tail round the lower part, and appeared much relieved, remaining now quite motionless in an oblique position, as if resting; the fins remaining quiet, and collapsed. It never left the stick, grasping it firmly and closely in a prehensile manner; and at times, but only occasionally, and without uncoiling the tail, it swung itself slowly round as far as it could reach, making the same quick fluttering motion with the fins as before, which set the branched filaments about them also in motion, by the impulse of the little currents of the water driven in a direction contrary to that in which the animal was at the moment moving. It breathed rather fast, but very regularly; the water rushing out vertically in two very strong little jets at each closing of the opercle, at the two branchial openings or spout-holes on the nape of the neck.

When deprived of anything to coil round, the tail, always remaining curled, was waved or twisted about vaguely, as if in search of something to grasp, rather than to assist in progression; its motion being far too slow and feeble for the latter purpose. The head appeared incapable of any

motion distinct from the trunk ; but was used sometimes as a stay or hook wherewith to raise the body, after the manner of a parrot in climbing.

It lived in this state for about twelve hours ; never voluntarily quitting its hold of the stick.

It was before mentioned that the *Hippocampi* are not known to be employed as food : and *Ælian* relates, on the report of certain fishermen, that one part of them is poisonous ; which, if true, might probably be only owing, as he says, to some noxious acrid substance eaten by the fish. Willughby refers to the same *Ælian* for their use as a remedy in hydrophobia ; and *Risso* at this very day says that, first dried in the sun, then gently roasted, and steeped in wine, they are esteemed, at least by sailors, serviceable for assuaging colics ; whilst *Dioscorides* again had mentioned long before their use made into an ointment for a specific against baldness ! The whole account in *Ælian* is so amusing, that I cannot forbear adding a translation of the chapter :—

“ There are experienced fishermen who say, that if the paunch of the *Hippocampus* be boiled down in wine and given for a drink, this potion is a poison of a strange unusual kind, compared with every other poison. For he who drinks it is first seized with violent hiccup ; then with a dry spasmodic cough, without expectoration ; the epigastric region swells and is distended ; an access of warm humours floats up into and loads the head, and passes down the nostrils in the form of a thin discharge, diffusing a kind of fishy smell ; the eyes become bloodshot and fiery ; the eyelids swell ; an inclination to vomit is excited, but nothing is brought up. If nature get the better, and the patient escape death, he gradually loses his memory and sinks into a state of mental aberration ; but, if the poison have crept lower than the stomach, it is a lost case,—he must die. Those who survive, but become insane, are possessed with a strong passion for water, and have a thirsty longing to behold it and to hear it flow, and this composes them and lulls them to sleep. And they delight to spend their time by everflowing streams, or near the sea-shore, or by lakes and fountains ; and, whilst devoid of all desire to drink, they love to swim, and bathe their feet or wash their hands. Some say, however, that it is not the paunch itself of the *Hippocampus* which is the cause of this ; but that the animal feeds on some extremely bitter (noxious, virulent, or acrid) seaweed (*φυκίον*, fucus) which imparts to it this quality. Nay, the *Hippocampus* has been found, by the sagacity of an old fisherman well skilled in sea-matters, even to be an efficacious remedy. The old man was a Cretan ; and his sons, young men, were, like their father, fishermen. Well then, it had happened that this old man having caught some *Hippocampuses* amongst other fishes, the young men, one after another rendering assistance to the first attacked, were bitten by a mad dog. They were then lying near the shore of Methymna



in Crete (a village, they say). The bystanders were pitying them, and directing that the dog should be killed, and his liver given to the young men to eat as a cure for the disease; others were recommending to take them to the temple of the Roccæan Diana so called, and supplicate the goddess for a cure. The old man, however, praising them for their good advice, took no further notice, but proceeded very fearlessly and boldly to cleanse the paunches of the Hippocampuses of their contents; and then some of these paunches he roasted, and gave them to his sons to take and eat: others he bruised with vinegar and honey, and applying them as a plaster on the wounds caused by the bites, so got the better of the canine madness in the young men, by the longing after water, which you will understand the Hippocampuses excited in them. And in this way he cured the boys, though he was a long time about it."

Ælian. de Nat. Anim. lib. xiv. cap. xx.

The poet Epimenides, as quoted by authority from which lies no appeal (Tit. i. 12), has left recorded of his countrymen of Crete no favourable character for credibility:

Κρήτες ἀεὶ ψεύσται, κακὰ θηρία, γαστέρες ἀργαί.

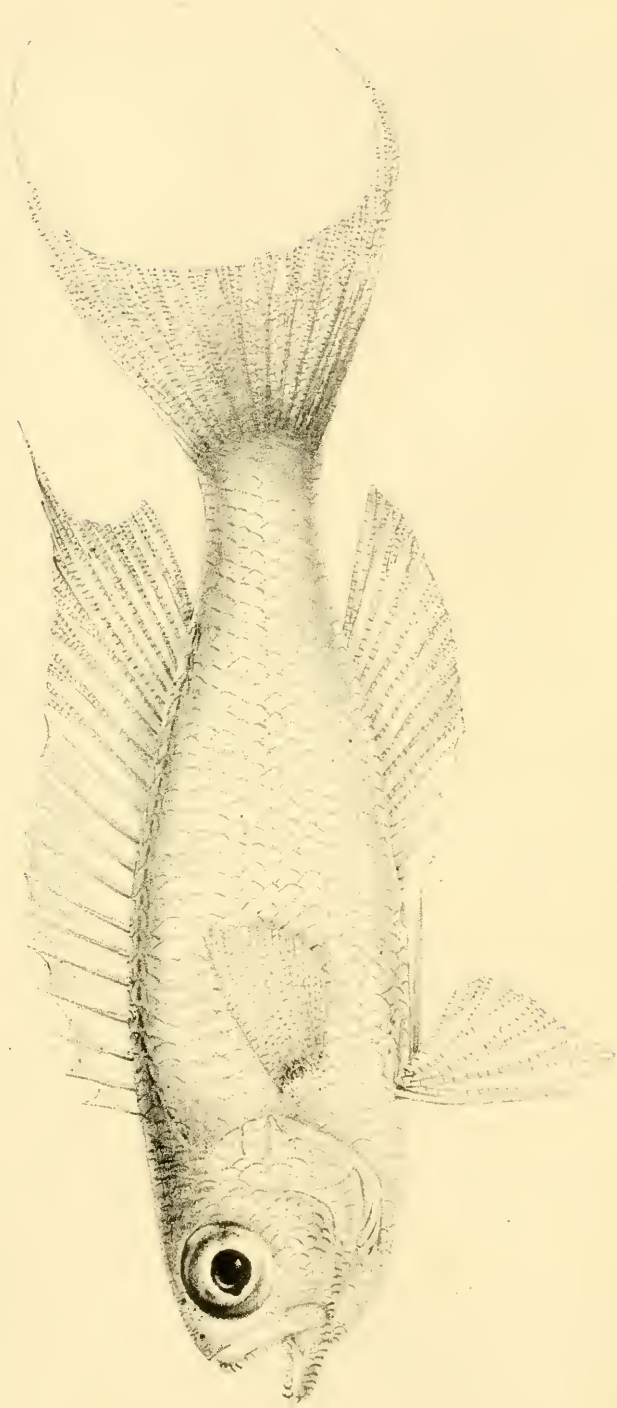
However, it is but fair to our old fisherman to mention, that his designation as a Cretan rests upon a merely conjectural, though certainly most probable, emendation of the text of Ælian by Gyllius.

No person who has once seen a Hippocampus can doubt the derivation of its Greek names *ἵπποκάμπη* and *ἵππόκαμπος* from *ἵππος*, a horse, and *κάμπη*, a caterpillar.

The figures in Tab. II. represent the *Hippocampus ramulosus* of the size, and in two of the attitudes, of life.







*T. 3. M. Y. del & Sc.*

## TAB. III.

## CALLANTHIAS PARADISÆUS, NOB.

*Castanhêta s. Imperador do alto s. da moda.*

BIRD OF PARADISE-FISH.

## CHAR. GEN.

*Caput* squamosum : *rostro* brevissimo, utrinque ante oculos s. *suborbitarium* extremo antico tantum, nudo ; *maxilla* utraque squamosa ; *dentibus* minutis, scobinato-fasciatis ; quibusdam anticis majoribus, caninis, instructa. *Præ-operculum* integerrimum. *Operculum* bispinosum. *Linea lateralis* dorso proxima, ad extremum *pinnæ dorsalis* continuæ evanescens. *Membrana branchiostega* sexradiata.

Oculi magni. *Pinna dorsalis* analisque nudæ, spinis exappendiculatis : caudalis squamosa, lunato-forcipata, lobis in fila productis. Squamæ asperæ, limbo echinulato, ciliato.

*Obs.*—Genus *Anthias*, Bl. simillimum, affine. Species adhuc unica, Maderensi-Atlantica, parva, roseo luteoque kete colorata.

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*C. paradisæus*, nob., Suppl. Syn. Mad. Fish in Proc. Zool. Soc. 1839, p. 76.

D. 11 + 10 ; A. 3 + 10 ; P. 20 v. 21 ; V. 1 + 5 ; C.  $\frac{2 \text{ v. } 3 + \text{VIII.}}{2 - 4 + \text{VII.}}$

M. B. 6 ; Squamæ lin. lat. 22—24 ; Vertæ. 11 abd. + 13 caud. = 24.

*Longit.* = 6 — 11 poll. = 5—7 × alt. fere.

*Tempus*, vere, æstate.

*Locus*, in rupibus minus profundis ; rariss.

THE new generic name affixed to this no less rare and interesting than elegant little fish, is meant to indicate its most obvious relation of affinity to *Anthias sacer*, Bl. ; whilst the specific appellation will recall a curious analogical resemblance which it bears in its bright hues of rose and yellow, and in the lengthened filaments of its tail, to certain of a very different race, the Birds of Paradise, *Paradisæa*, L.

A less remote or fanciful analogy remains to be assigned amongst its own legitimate and proximate allies, the fishes. *Callanthias* and *Anthias* in the *Percidæ* bear so precise an analogy of parallelism to the Labrid genera of *Labrus* and *Crenilabrus*, that, except by the common characters which mark respectively the family of each pair, they would scarcely be distinguished. And this explains why several Percido-Serranoidous fishes have been, like *Anthias sacer*, Bl. itself, by some naturalists actually referred to the Linnæan genus *Labrus*.

Indeed, wherever this last-mentioned fish be placed by systematic writers, *Callanthias* might reasonably be sought for in its near vicinity. By Bloch himself, it must, however, have been included, had he been disposed to

follow strictly out his own definitions, either in his genus *Bodianus* or *Cephalopholis*, on account of the entire pre-opercle. The six-rayed branchiostegous membrane would probably have induced MM. Cuvier and Valenciennes to place it rather in or near *Dules*, Cuv. than in the same group with its apparently more natural ally, viz. *Anthias sacer*, Bl. (*Serranus anthias*, Cuv. and Val.) Convinced, however, that the group including *Anthias sacer*, Bl. should be again detached from the true *Serrani*, it becomes still more imperative to separate from both, *Callanthias*: a measure strongly sanctioned by the peculiar ending and situation of the lateral line, which serves to distinguish it at once from all these genera, and forms another most curious and unexpected link with *Chatodontidae* through *Glyphisodon* and *Heliastes*, Cuv. and Val.; the entire pre-opercle, and the six-rayed branchial membrane, confirming at the same time this relation, and the other analogy above remarked with *Labrus*.

The present fish has actually the character assigned by Bloch to *Bodianus*, of a perfectly entire pre-opercle; which none, however, of the truly Percidous\* species, placed by him therein, perhaps actually possessed.† Nor is the value of this mark, as a distinctive character for *Callanthias*, really affected by *Serranus oculatus*, Cuv. and Val. of which it is remarked, “La dentelure du pré-opercule est presque imperceptible.” (Cuv. and Val. ii. 268.)‡ And though in this particular respect, and in the scaly head or muzzle, *Callanthias* technically disagrees still less with *Cephalopholis*, Bl. than with his *Bodianus*, yet it appears to differ far more widely from the former than from the latter in its natural affinity: the genus *Cephalopholis*, or at least its principal representative, *Ceph. argus*, Bl. being by MM. Cuvier and Valenciennes absorbed into *Serranus*, amongst the group *Merous*. (See *Serranus argus*, Cuv. and Val. ii. p. 360.) At all events, if *Cephalopholis argus*, Bl. agree with *Callanthias* in the really entire pre-opercle and the scaly lower jaw, it differs in the lateral line, and in the number of the branchiostegous rays; which, in the absence of all positive remark, may be supposed, in a fish referred by MM. Cuvier and Valenciennes to *Serranus*, not to differ from the rest of its congeners.

From *Anthias* and *Mesoprion* again, *Callanthias* differs, whilst in teeth

\* His *Bodianus bodianus* is a *Crenilabrus*. See Cuv. R. Anim. 2nd edit. ii. p. 260, note (2.)

† See Cuv. R. An. ii. 141, notes; Cuv. and Val. Hist. ii. pp. 211, 280.

‡ This fish may surely be considered as the type of a distinct generic group (*Hesperanthias*, nob.); of which the following appear to be the leading characters:—

Caput subnudum: maxillarum superiorum extremitatibus squamosis; rostro, suborbitario omnino, maxillaque inferiore nudis. Dentes fere *Anthie* s. *Callanthie*. Præ-operculum tenuissime denticulatum. Operculum bispinosum. Linea lateralis continua, æqualis. Pinna dorsalis subbipartita s. profunde emarginata: caudalis furcata. Membrana branchiostega (ut videtur) septemradiata.

Obs.—Oculi magni. Colores læti. Forma gracilis, elongata.

Species, *Hesperanthias oculata*, adhuc unica; (*Serranus oculatus*, Cuv. and Val. Hist. ii. 266. t. 32.)

agreeing, in the sharply two-spined opercle; and conversely, agreeing with *Centropristis* in this last particular, it differs in the teeth; equally disagreeing with all three in the six-rayed instead of seven-rayed branchiostegous membrane.

From *Dules*, *Therapon*, *Datnia*, *Pelates*, and *Helotes*, the only remaining genera with which it possibly might be confounded, on account of agreement in this last-named point, *Callanthias* may be distinguished thus: it differs principally from the first, which seems however after *Anthias* to contain its nearest natural allies, in the teeth; from the second, in the even, not notched or interrupted dorsal fin; from the third, in having teeth on the palatal bones; from the fourth and fifth, both in the teeth and in the even dorsal fin. Whilst from the whole of these eight genera it is at once distinguished by the truly entire pre-opercle, and the peculiar lateral line.

Its place in the system of MM. Cuvier and Valenciennes would be next *Dules*; and ranging in that series of *Percidæ*, which have the branchial membrane six-rayed, it bears to *Anthias*, in the parallel seven-rayed series, the same relation which the genus *Dules* bears to *Centropristis*.

This little fish, so complicated in its affinities, analogies, and characters, must be accounted of considerable rarity; though, doubtless, from its general resemblance in colour, size, and shape, often escaping notice amongst the multitudes of the common *Castanhêta* (*Anthias sacer*, Bl.) brought almost daily to the market. The fishermen, however, recognize its difference; and say, that although taken usually in company with the common sort, and at an equal depth, it is a more wary fish, and only caught occasionally, or, as it were, by accident.

Some years ago a single specimen occurred; but the notes and sketch then taken were deficient in detail, and, remaining so long unsupported by the discovery of other individuals, seemed insufficient to warrant the insertion of *Callanthias* in the Synopsis of Madeiran Fishes, last year published in the Transactions of the Zoological Society of London. Five individuals have again this year (1838), by the unwearied vigilance and kindness of G. B. Leacock, Esq. of this island, been obtained; and these, agreeing perfectly with the first, have furnished the materials for the following description:—

Shape oblong, compressed, slender, somewhat elongated; the outlines of the back and belly nearly straight and parallel; the former, especially, not high and arched like *Anthias sacer*, Bl.; hence the comparative shallowness and slenderness of form.

The depth is nearly equal from the hinder edge of the opercle to the origin of the anal fin, and is from one fifth to one sixth of the whole length, or from one third to one fourth of the length from the tip of the muzzle to the middle of the fork of the caudal fin. The thickness is greatest on the head just behind the eyes, and is



rather more than half the depth. The belly is a little flattened, or even channelled underneath, for the reception of the ventral fins.

The front is low, descending very slightly and continuously from the origin of the dorsal fin nearly to the extremity of the muzzle at the front of the eye, where it at once falls suddenly and almost vertically.

The head in length equals, or rather exceeds, the greatest depth of the fish. Except the two opercular spines, it is entirely unarmed and plain. The whole is covered with conspicuous scales, like those upon the body, except a smooth and naked triangular space on each side of the very short and abrupt muzzle in front of the eyes, comprehending the anterior ends of the suborbitaries, of which the hinder halves under the eyes are scaled. The top of the head between the eyes is broad, plain, convex, scaled down to the lip; the scales becoming gradually smaller. The nostrils are two simple orifices, more than usually remote from one another; the hinder or upper one is situate high up, and nearly on a level with the top of the eyes, within the scaly part, but close upon the orbit; the anterior is placed lower and considerably forwarder, upon the confines of the same; it is small and indistinct. The orbits are quite plain. The eye is large and very beautiful; its diameter equals, or a little exceeds, one third part of the length of the head. The maxillaries are very slender or narrow, their exposed dilated ends being distinctly scaled: the space between them and the eye, or the middle part of the suborbitaries, also is extremely narrow; the scales extending forwards on these last bones as far as to their narrowest middle part, before the lower corner of each eye.

Mouth or gape moderate, whitish or pale inside: when closed, its commissure ascends obliquely; somewhat as in *Priacanthus*. The upper jaw is very short, abrupt, and truncate, with a wide notch in the middle; reminding one strongly of *Beryx*, *Polymixia*, or *Brama*. The lower jaw is slender, and when open appears longer than the upper; but fits when closed within it. A narrow band of scales extends from the canthus of the jaw along its branches forwards to the tip. Lips in both jaws distinct, smooth, naked. In the upper jaw, the smooth edge of the muzzle forms a kind of secondary lip.

The teeth are as in *Anthias*. In the upper jaw the intermaxillaries are furnished with a narrow band of chiefly minute brush-like teeth, of which the outer ones are larger and recurved, with one or two still larger towards the front; and generally quite in front, one on each side the notch, there is a pair of more distinct and larger conical canines, directed vertically downwards, and placed outside the band, or, as it were, upon the outside of the gum or lip. Sometimes, instead of one, there are two or three of these on either side the notch. The vomer is but feebly armed with two or three pretty distinct teeth. The palatines are also ill provided with a few teeth only, towards the front, and in a single row.

In the lower jaw the teeth are reduced almost to a single row at the sides, becoming a narrow band only in front, with two or three larger, conical, but still recurved ones, close together on each side near the tip; and at the tip itself, outside the others, just as in the upper jaw, there is a pair of straight and conical canines pointing forwards, larger and more conspicuous than the rest. The tongue is free, small, narrow, pointed, smooth, and white. No pores are visible about the head.

The cheeks and pre-opercles are covered entirely with scales. The hinder edge of the latter is straight and nearly vertical; the lower horizontal, with the angle rounded. Both edges are completely hid and overwrapped by scales; on the removal of which they are found to be perfectly entire, plain, and smooth, without trace of teeth or even of striae. The inter-opercle is broad, triangular, scaled,

entire. The opercle and sub-opercle are also scaled to the edge, and entire. On the prominent and somewhat abrupt angle of the opercle, just above the axil of the pectoral fins, are two adressed straight spines, parallel to each other. They are small but distinct; and, though slender, are pretty strong and pungent. The gill-opening is rather large, extending forwards halfway under the eye. The branchiostegous membrane is supported by six strong and broad rays. Its fore part, under the throat, is scaled.

The shoulders and axils of the pectoral fins are quite plain, and scaled: the supescapulary, scapulary, and humeral bones not being perceptible externally.

The scales are large, arranged in horizontal straight lines; not following, at least along the middle of the sides, the curvature of the lateral line or back. They are very rough to the touch, when the finger is drawn forwards towards the head, owing to a border of thick-set adressed prickles on their outer edge. The centre of each is smooth: the fore part is radiato-striate, like a fan, with about twelve ribs. Their shape is vertically oblong, higher than long.

The lateral line ascends abruptly and steeply at its origin, till it approaches quite close to the line of the back, at about the fifth or sixth spine of the dorsal fin. It continues close along the base of the same to the root of the last soft ray; where all trace of it disappears. Its scales are longitudinally oval or elliptic, marked by a raised tube; their hinder or outer edge is not muricate like the others, but smooth.

Above the lateral line, beyond the fifth or sixth spines of the dorsal fin, there is only a single row of narrow, irregular, dimidiate, pointed scales; appearing as if formed of others cut in half.

On the pre-opercle there are about five or six semicircular rows of scales, like those on the body; increasing in size towards the edge.

On the opercle there are about five rows.

On the lateral line, to the end of the dorsal fin, there are from twenty-two to twenty-four marked scales; thence to the caudal fin along the ridge of the back, about ten or twelve of the ordinary unmarked sort.

From the first marked scale of the lateral line, in a straight horizontal line to the caudal fin, there are about thirty-eight scales in a row; not reckoning the minute ones on the caudal fin itself.

Between the edge of the opercle and the vent, there are about twelve scales in a row; reckoning obliquely downwards from the lateral line.

The dorsal fin commences in a vertical line with the upper axil of the pectoral fins, and extends along three-fourths of the remainder of the back. It is lowest in front, the spines becoming gradually longer; the four or five last are, however, nearly equal. All the spines are rather weak and slender, and without any trace of filamentous appendages to their points. The hinder soft-rayed part joins on continuously, without notch or interruption, with the first; its rays gradually lengthening to the fourth or fifth, which, with the preceding and following rays in less degree, is produced into a slender filamentous point, reaching to the base of the caudal fin.

The anal fin begins opposite the ninth or tenth spine of the dorsal fin, and ends at the point corresponding with the termination of the same.

The spines are rather stronger and broader than in the dorsal fin. The hinder soft-rayed part is somewhat pointed or acuminate; but all its rays, or, at least, the last eight or nine, are of nearly equal length.

The whole of both the dorsal and the anal fins is perfectly naked or free from scales; their base is seated in a shallow groove; and the last ray of each is forked or divided to the base, appearing double.

The pectoral fins are short, broad, remarkably obtuse, or even truncate. The first two rays are simple; the second is barred; the third both branched and barred; the nine or ten next are the longest and equal; the two last are short and simple, but barred.

The ventral fins originate just beneath the lower axil of the pectoral; their tips reaching just to the base of the first or second spine of the anal fin. They are ovato-triangular, rather large; but not produced, like those of *Anthias sacer*, Bl. Their first spine is about three fifths of the length of their first branched ray; the second soft or branched ray is the longest; and their last ray is free, not webbed to the body. They are placed quite close together, with a long, pointed, scaly appendage between them, underneath the belly; and each fits under a slight ridge on the sides of the belly, having also a rather larger but not very distinct or pointed scale at its outer or upper axil.

Both pectoral and ventral fins are perfectly free from scales.

Caudal fin strongly lunate; the two or three outermost branched rays at the top and bottom are produced into long, slender, flexible, and hair-like filaments, of which that of the uppermost fork or lobe is (contrary to *Anthias sacer*, Bl.) the longest. The outer rays are much crowded. The web or membrane between all the rays is scaled in imbricated lines up nearly to their tips.

The general colour of the body is a delicate lilac-rose, becoming on the ridge of the back a full deep rose, and passing into paler tints towards the belly. The throat and fore part of the belly are a delicate pearly white. A broad suffused tint of yellow extends from the eye just beneath the ridge of the back to the end of the dorsal fin.

Top of the head deep rose, with lilac tints. Upper lip yellow; scarlet in the middle. Tip of the lower lip also scarlet; the sides pale or whitish. Naked space before each eye scarlet. Both the opercles, and a patch before the pectoral fins, richly pearly, or iridescent white. Eye most beautifully coloured. The ground of the iris is pearly; its lower part varied with stains or clouds of yellow, and richly iridescent. The upper part with a permanent bright violet stain passing into lilac, leaving the inner edge clear. Pupil black.

The dorsal and anal fins are bright yellow; the soft rays tipped and stained with red or rose. The base of all the rays is rosy.

The pectoral fins are pale scarlet or flesh-colour, and pellucid. The rays are paler than the web.

Ventral fins whitish; more or less stained with yellow, and tipped or streaked with red.

Caudal fin scarlet or reddish orange in the middle; the borders and forks yellow.

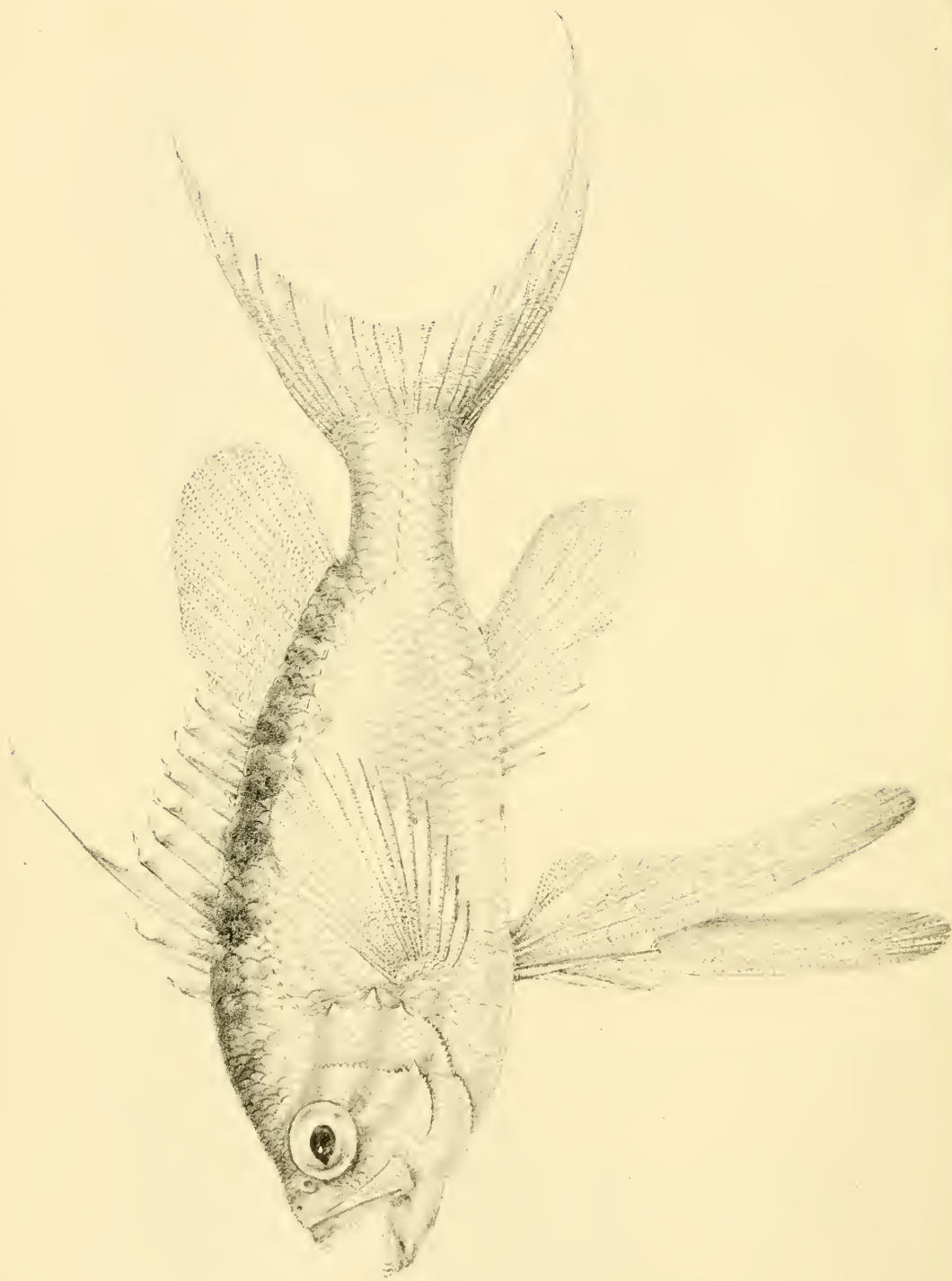
Of the anatomy, I have only to observe, that there are three very large and distinct, but short *cæca* surrounding the *pylorus*. The liver is small.

The largest individual which has hitherto occurred, measured seven inches from the tip of the muzzle to the middle of the forks of the caudal fin; or eleven inches to the end of the upper filament of the same. It was taken early in the month of August.

It is remarkable in this fish, that some time after death, when it is beginning to grow dry or stale, the red colour of the sides collects, as it were, into a large, round, suffused, scarlet patch, on the flanks or middle of each side, at the end of the dorsal or anal fins.

The figure is the size of life.







## TAB. IV.

## ANTHIAS SACER, BL.

*Castanhêta s. Imperador.*

THE BARBER.

CHAR. GEN.

*Caput* squamosum: *rostr*o brevi, utrinque autē oculos s. *suborbilarium* extremo antico tantum nudo: *maxilla* utraque squamosa; *dentibus* minutis, scobinato-fasciatis, quibusdam auticis majoribus, caninis, instructa. *Præ-operculum* dentatum. *Operculum* subtrispinosum. *Linea lateralis* postice deflexa, deinde recta, continua. *Pinna dorsalis* continua. *Membrana branchiostega* septemradiata.

Oculi magni. *Pinnæ dorsalis* analisque *spinæ* appendiculatæ; parte posteriore subsquamosa. *Pinna caudalis* squamosa, lunato-forcipata, lobis in fila productis. *Squamæ* asperæ, limbo echinulato, ciliato.

*Obs.*—Pisces marini, parvi, roseo flavoque plerumque lætissime colorati; regionum calidiorum incolæ, sublittorales.

## CHAR. SPEC.

A. roseus; capite utrinque flavo trifasciato; dorso flavo-olivaceo vel æreo-fuscescente nebuloso, seriatim submaculoso: *pinna dorsali* analique roseis, flavo marginatis; illius *spina* tertia producta; ventralibus maximis, productis, dimidium longitudinis subæquantibus; *caudalis* lobo s. filamento inferiore longiore.

D. 10 v. 11 + 15; A. 3 + 7; P. 2 + 16; V. 1 + 5; C.  $\frac{4 + I + VII.}{3 + I + VI.}$

M. B. 7; Sq. lin. lat. 41; Vert.æ, 10 abd. + 16 caud. = 26.

*Anthias sacer*, "Bl. pl. 315;" Cuv. R. Anim. ed. 2. ii. 140.

*Serranus anthias*, Cuv. and Val. ii. 250. t. 31.

*Ailopon anthias*, Risso, Hist. Nat. iii. 373.

"*Lutjan anthias*, Lacep. t. IV. p. 197;" Cuv. and Val. l. c.

*Labrus anthias*, Linn. Syst. ed. 12, I. 174, 3.

*Labrus totus rubescens, cauda bifurca*, Arted. Synon. 54, 3.

*Anthias, primus Rondeletii*, Will. Hist. Pisc. 325. t. X 5, f. 5.

*Anthiæ prima species*, Rondel. (ed. Lugdun. 1554) 183.

*Longit.* = 6—8 poll. =  $3\frac{1}{4}$ — $4\frac{1}{2}$  × alt.

*Tempus*, per totum annum.

*Locus*, in rupibus minus profundis; vulgatiss.

No less than four fishes are designated in Madeira by the common name of "*Castanhêta*:" viz. *Anthias sacer*, Bl.; *Callanthias paradisæus*, nob.; *Heliastes limbatus*, Val.; and *Glyphisodon luridus*, Cuv. The simple name is used indifferently for the first and third: but, if distinction be

the object, the first is called "*Castanhêta amarella*;" and the third still more frequently "*Castanhêta baia*." The second and fourth are scarcely ever mentioned without their respective adjuncts of "*do alto*" or "*da moda*," and "*Ferreira*." Occasionally the first and second are also called "*Imperador*:" and if the two last are named together, which from their obvious affinity they often are, they are always distinguished as *Castanhêta baia*, and *Castanhêta Ferreira*.

In the Règne Animal, the illustrious Cuvier has subdivided the *Serrani* into three groups, under distinctive names: viz. "Les Serrans propres ou *Perches de mer*," "Les Barbiers (*Anthias*, Bl. en partie)," and "Les Mérours." The more complete reunion of these under a single name *Serranus*, in the Histoire des Poissons, is surely no improvement; at least in regard to "Les Barbiers" or "*Anthias*, Bl. in part:" the principal species of which group, abundant in Madeira, though apparently a rare fish in the Mediterranean sea, is the subject of the accompanying plate. The main reason for this later combination, made by MM. Cuvier and Valenciennes, seems to have been the gradual blending of certain of the characters of *Anthias*, in supposed defect of others, with those of the true *Serrani*.\* But this is a position which, if carried out into consistent practice, would go far to abolish most established genera. For illustration of a sounder rule, I need but quote, from the same volume, Cuvier's own genus, *Plectropoma*; which he has separated from *Serranus*, though confessing, "Nous ne les en séparons que pour donner plus de facilité à la nomenclature:"† whilst a striking case, in abrogation of the former proposition, might be drawn from a very brief comparative examination of his genera *Labrus* and *Crenilabrus*. I am acquainted with a fish,‡ which, in its principal character, varies permanently, and not by age, from one of these groups to the other.

In adopting, however, Bloch's generic name, it is needful to observe that it is confined here to perhaps only a single species of the fishes to which he applied it;§ answering, with one exception (*Hesperanthias oculatus*, nob.), to "Les Barbiers" of Cuv. and Val. Hist. iii. 249—270. His error also, derived indeed from Rondelet, is not to be followed in supposing the fish here figured to be the *αγθίας* of Aristotle, Pliny, Ælian, and others, to which such marvellous instincts are ascribed in the

\* See Cuv. and Val. Hist. ii. pp. 249. 280.

† Ibid. ii. p. 337.

‡ *Crenilabrus caninus*, nob. Synopsis in Trans. Zool. Soc. vol. ii. p. 136.

§ "La plupart de nos Mérours sont encore des *Anthias* pour Bloch, mais nous restreignons ce genre aux espèces auxquelles notre définition convient. Bloch a été si peu exact, que son *Anthias saur* n'a pas même le caractère attribué au genre *Anthias* d'un opercule sans épine."—Cuv. R. An. ed. 2. ii. p. 140, note (1).

following lines of the elegant little fragment on the defensive instincts of fishes, attributed by Pliny to Ovid; but which some later critics have supposed to be the composition of Grattius Faliscus. The style, however, is certainly Ovidian.

“ Anthias his, tergo quæ non videt,\* utitur armis;  
Vim spinæ novitque suæ, versoque supinus  
Corpore lina secat, fixumque intercipit hamum.”

HALIEUT. 45—47. OVID. OP.

The greatest difficulty indeed encumbers the attempt to ascertain this *Anthias*† in modern nomenclature; for although it may safely be affirmed that not one of the ancient Greek and Roman authors intended by this name to designate the subject of the present chapter, there can be little doubt that they confounded several other fishes under it. The *Aulopias* of that omnivorous compiler, Ælian (Lib. xiii. cap. 17), a gregarious fish, attaining a size less only than the largest Tunny, to which it is in strength and force superior, with large round eyes, and of the deepest blue (κυανοῦ) on the back, with the belly white, and a golden stripe from the head to the tail, ending in a circle, might well, as Cuvier conjectures (Hist. ii. 261), be the *Thynnus alalonga* Cuv. and Val., the *Atum Avoador* of Madeira. And that this *Aulopias* was at least a kind of *Anthias*, though Ælian was ignorant of this, may be inferred from his subjoining to this description an account of its capture very similar to that which Oppian (‘Αλ. γ. 205—280) gives of that of *Anthias*: and more precisely still from Oppian’s line, relating to one sort of his *Anthias*.

Ἄλλους δ’ εὐωπούς τε καὶ αὐλωπούς καλέουσιν.

‘Αλ. α. 256.

But this identity is rendered nearly certain by Aristotle’s direct statement long before, that the *Aulopias* is also called *Anthias* (αὐλωπίας ὃν καλοῦσιν ἀνθίαν. Hist. Z. 25. 3). Again, the large toothless *Anthias* of Op-

\* The frequent reading “tergo quæ concutit,” adopted by the Elzevirs, Burman, Maittaire, &c. rests merely on a conjectural emendation of Heinsius.

† “Where an *Anthias* is seen,” says Aristotle, “there is no fierce beast: of which sign the sponge-divers avail themselves, and call these fishes sacred. And this seems something of the nature of a symptom: as where there is a snail-shell, there is neither swine nor partridge; for they eat up every snail-shell.” Arist. Hist. (Schn.) I. κε. 3. See also Athenæus, (Dindorf.) vii. 17; Plutarch de Solertia Animal. (Reiske, Lips.) Vol. x. p. 84; and Eustathius in Hom. Il. σ. 407.—Pliny (ix. cap. 47) attributes the epithet of sacred on the same ground to the “flat-fishes” (*planos pisces*); perhaps misunderstanding Aristotle to include these, of some of which he has indeed immediately before been speaking, in the passage above-quoted, under the expression, “these fishes” (ἰχθῦς τουτούς). Yet many different fishes doubtless were so designated: and Athenæus has a chapter (vii. 18) beginning with the inquiry, “What is the fish called sacred?” However, Bloch’s application of this title after Rondeletius, to the subject of the present chapter, is clearly founded upon its supposed identity with Aristotle’s *Anthias*.

pian ('Αλ. α. 253, and γ. 328), of which he says\* there are four kinds, three being distinguished by their yellow, white, and dark blood-red colours, and the fourth (called also *Euopus* and *Aulopus*) by its dusky eyebrow or eye-circle, seems at least to be compounded of a *Lampris*: the sharp fore-edge of whose dorsal fin was very likely to suggest the story ('Αλ. γ. 33) embodied somewhat previously by Plutarch in his treatise De Solertia (Reiske, x. p. 68), and considerably earlier by the Roman poet in the foregoing extract from his Halieutics; and the gay florid colouring of which agrees well with the hint afforded by the etymon of ἀνθίας, viz. ἄνθος, a flower.

The Madeiran *Anthias* rarely exceeds eight or ten inches in length. Its form is oblong, and compressed; the greatest depth, at the origin of the pectoral or ventral fins, is about one fourth of the entire length, or one third of the length to the root or base of the middle rays of the caudal fin. The back is rather high and arched; but its degree of elevation varies in different individuals, some being considerably more hump-backed than others. Line of the belly nearly straight and horizontal; a little prominent only at the throat, just before or underneath the pectoral fins. The thickness, greatest on the shoulders, is contained about two and a half times in the depth.

The length of the head is less than the depth of the body. The profile descends gradually and evenly, but rather steeply, from the first ray of the dorsal fin or a little before it; rising into a slight prominence before the eye, and thus giving the muzzle a somewhat swollen appearance: this part, though short, is rather pointed and projecting. Whole head scaled, except an ill-defined and narrow space before the eye on each side of the muzzle, the lips, and the edge or border of the front, above the upper lip. Maxillaries scaled completely over their exposed parts. Suborbitaries scaled, except their fore ends, which are traversed by the smooth band or space before the lower fore corner of each eye. Cheeks and opercles also scaled all over. A narrow ill-defined band of minute scales, extends forwards from the corners of the mouth along the branches of the lower jaw, becoming narrow and evanescent towards its tip. The top of the head is slightly convex and scaly. Nostrils remote: the hinder a distinct round orifice close to the edge of the orbit, above the fore part of the eye, within the scaly part; the anterior is smaller, indistinct, and placed both considerably forwarder and lower, near the tip of the muzzle, in the naked part. The eye is large and beautiful; its diameter nearly equals one third of the length of the head. The orbits are quite plain and unarmed.

The mouth is of moderate size; the commissure, when closed, is considerably oblique; the lower jaw somewhat slender, and longer than the upper. The ends of the maxillaries are broad and strong. In the upper jaw, the intermaxillary teeth form a very narrow band, the outer row of which is larger; on the sides they are hooked forwards, straighter towards the front; with one or two in front on each side considerably larger, straighter, and a little inclining forwards. Palatines and vomer not copiously scobinate.

\* Τέσσαρα δ' ἀνθίων μεγκακήτεια φύλα νέμονται,  
ζανθοί σ', ἀργεννοί τε, τὸ δὲ τρίτον αἶμα κελαινοί·  
ἄλλους δ' εὐωπούς τε καὶ αὐλωπούς καλίουσιν,  
οὐνεκα τοῖς καθύπερθεν ἐλισσομένη κατὰ κύκλον  
ὀφρὺς ἡρόσιμα περιδρομοὶς ἐστεφάνωται.

'Αλ. α. 254—258.



The sides of the lower jaw are furnished, like the upper, with teeth hooking forwards, straighter towards the front; and on each side, fitting, when the mouth is closed, behind the larger teeth of the upper jaw, there is a pair of much larger and stronger teeth, or sometimes only one, hooked strongly backwards, in an opposite direction to the rest. On each side just in front, and growing, as it were, out of the gum, below the line or level of the rest, stands a single, strong, conic, canine tooth pointing forwards.

The tongue is free, narrow, thin in front, and quite smooth.

Edge of the preopercle nearly vertical and straight; its teeth fine, regularly enlarging downwards, till at the rounded angle there is one abruptly larger than all the rest. Below this they are more irregular and distant, but larger than above the angle. The edge of the interopercle is usually entire; that of the subopercle is sparingly and irregularly serrulate.\*

The opercle is rather narrow, furnished with three distinct angles near the top at its hinder edge, the two lower of which are produced into strong, sharp, flattened spines; but the third or uppermost can scarcely be called more than a bony point or angle. Of the two spines, the uppermost is larger, more conspicuous, and produced; the lower less distinct and shorter. The whole is covered with five or six rows of scales, quite up to the base of the spines; behind which there is a skinny border, covered with very minute scales, and produced into angles, corresponding with the two *upper* spines or angles only.

The lateral line rises obliquely at its origin, following the curve of the back, not far below the base of the dorsal fin, to its end; it then descends to the middle of the body, where it makes an abrupt bend, and continues in a straight line to the base of the caudal fin, along the middle of the fleshy part of the tail. Each of its scales is marked by a prominent, broad, single tube.

The ordinary scales are large, with a rough echinulate border, and the edge ciliate.

The dorsal fin begins quite on the nape; and although its hinder soft portion is more produced backwards than the rest, it is even and continuous. The first spine is rather short; the second twice as long; the third is as once produced to twice, or twice and a-half the length of the second; the fourth, and following ones, again, are only a little longer than the second, and all are of nearly equal length. All the spines are rather strong, and furnished with a skinny filament, like a ship's pennon, attached just below their point. The soft-rayed hinder portion of the fin appears, from the prolongation of its hinder rays, when collapsed, to be produced into a filament like the caudal fin; but when expanded, it is scarcely pointed. Its rays are close and crowded. A single row of minute imbricated scales extends some distance up the web between each ray. The front axils of some of the first and hinder spines are also similarly, but more slightly, scaly, the scales rising with the spine. Still, though the web of the spiny part is, generally speaking, "naked," the base of the soft-rayed hinder portion is distinctly "scaled." The spiny fore part only of this fin is seated in a groove.

The anal fin commences opposite the soft-rayed part of the dorsal fin, with which it corresponds. It is short, pointed behind, the anterior three or four soft rays,

\* In MM. Cuvier and Valenciennes's *figure*, both the interopercle and subopercle are represented serrulate. In their *description*, the latter only is expressly said to be so: "Il y a aussi quelques dentelures au bord inférieur de son subopercule." Cuv. and Val. Hist. ii. 251.

The fact is, that in the Madeiran fish at least, the interopercle varies, sometimes on different sides of the same individual, from quite entire to subserrulate, or with two or three teeth crowded at its upper corner; though it is generally on both sides perfectly entire. The subopercle is, however, almost always more or less serrulate.



except the first, being a little produced or drawn out into filaments. Its spines are very strong, without distinct appendages or filaments. The web of the soft-rayed part is scaled a little way up between the rays, but less distinctly than in the corresponding part of the dorsal fin.

The pectoral fins are ovate, scarcely so long as the head, with lines of scales running a considerable distance up between the rays; of which, the two first, though barred or articulated, are simple or unbranched. The web of these fins is pellucid, and extremely delicate and fragile; so that the ends of the rays are generally partly free. The lower rays are also somewhat fleshy in the middle, and very thickly barred or ringed: presenting some analogy with the *Scorpenidæ*.

The ventral fins, placed just beneath the pectoral, are very long; their tip reaching considerably beyond the end of the base of the anal fin, and sometimes quite to the base of the caudal fin. Varying a little in this respect, they may be said, generally, to equal half the length from the tip of the muzzle, to the middle of the fork of the caudal fin. When collapsed, as when the fish is out of the water, these fins appear finely acuminate: but when expanded carefully in water, their tips are found to be really more or less obtuse or rounded; varying often in degree on the two sides of the same individual; and with the web between the extremities of the branches of the rays generally torn. The outline traced out, however, by the projecting tips of these is always rounded. The branches of the first, second, and third soft rays, are nearly equally produced; but the second is a little the longest. Their web is perfectly naked.

Caudal fin between forked and lunate; the lobes conspicuously produced into filaments by the prolongation of their four first branched rays, chiefly of the second and third; the lower fork, or filament, contrary to *Callanthias*, being considerably longer than the upper. The web between the rays is thickly scaled a long way up, in imbricated lines of fine, small, oblong scales, almost concealing the rays, which are much crowded, and difficult to reckon towards the outside of the forks.

Colour fine pink or rosy, with a lilac tint; mottled along the ridge of the back with indistinct spots of dusky olive-yellow, which extend a little way down the sides, but grow paler, and presently blend into a yellow tint. Towards the belly pearly-whitish, iridescent.

Sides of the head rosy, with three yellow or olive-yellow horizontal bands; one close above, another through the middle of the eye, ending between the two lower spines of the opercle; the third under the eye, and ending in a yellow spot or patch at the base of the pectoral fins. The lips are rosy. The iris chiefly pale-violet or lilac, on a silver ground. The dorsal and anal fins are rosy along their base, bordered with yellow; the *lacinia* of the former yellow. The pectoral fins are pale scarlet rather than rosy. The produced fore-part of the ventral fins is bright yellow, orange towards the tip: their spine or fore-edge pink or rosy; their hind-part white, beautifully spotted with yellow. The caudal fin is yellow, with the outer edges pink; the filaments and middle often orange.

I have been thus circumstantial in the description of this common species, not merely for the sake of contrast with *Callanthias*; but because it is precisely in these "common species" of a place that similarity is most frequently mistaken for identity. The Atlantic fish appears, however, not to differ from MM. Cuvier and Valenciennes's description of the rarer Mediterranean, except in the rather longer ventral fins, and in the scaliness of the soft-rayed portions of the dorsal and anal fins;

points insufficient in themselves to establish any permanent specific distinction.

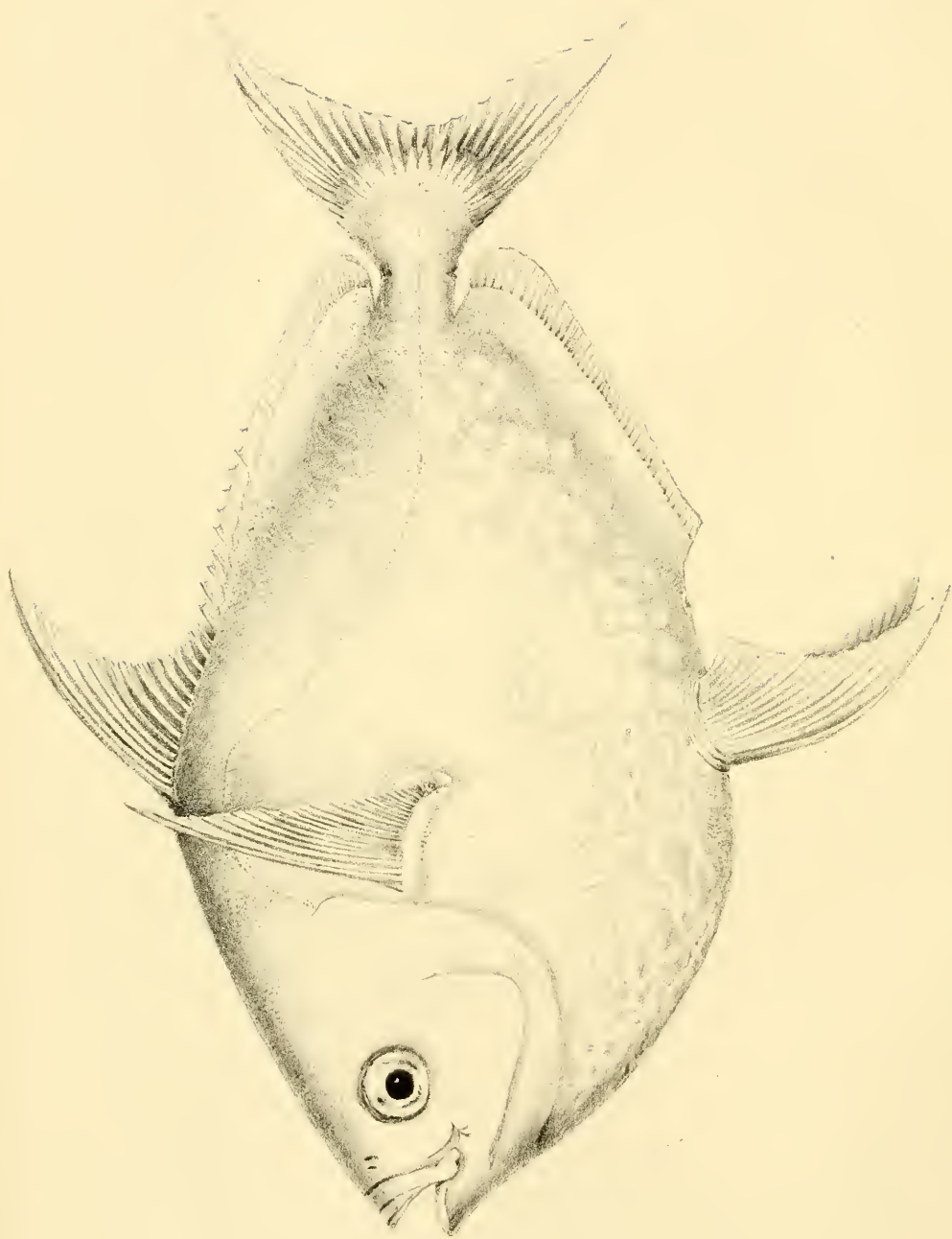
The Madeiran fish is most abundant at all seasons. That of the Mediterranean, however general, appears not to be common; and Willughby expressly mentions, that he had never seen it. It has not yet been taken in the British seas. Pennant long since appears to have sent Bloch a drawing, taken from a Gibraltar specimen. Cuvier says, "Toute la Méditerranée parait le produire; nous l'avons de Nice, de Naples, et de Sicile." At Nice, Risso informs us it is called "*Sarpanansa*." Its French name of "*le Barbier*," by which Rondelet originally mentions it is called at Montpellier, may have been given it, in fanciful allusion to the produced spine of the dorsal fin resembling, with its pennon-like appendage towards its point, a barber's pole.

The flesh is delicate enough when fried. Yet are the large bones and spines so troublesome, that its chief consumption is amongst the poorer classes, to whom it offers an abundant and continual supply.

The figure is the size of life.







*T. 5. M. Y. del & Sc.*



## TAB. V.

## LAMPRIS LAUTA, NOB.

*Peixe Cravo.*

MADEIRAN OPAH.

CHAR. GEN.

Os subprotractilis, edentulus. Corpus squamis membranaceis, deciduis, parvis. Pinna dorsalis analisque unica, continua; dorsali antice alta, acuminata. Pinnæ pectorales ventralesque elongatæ, basi horizontali; ventralibus pluriradiatis. Pinna caudalis lunata vel furcata. Pinnarum omnium radii cartilagineo-cornei.

*Obs.*—Pisces grandes, coloribus pulcherrime picti. Pinnarum radii flexiles; nec spinosi, nec distinctius articulati.

CHAR. SPEC.

*L. lingua lævi*: membrana branchiostega sex-radiata: cauda ecarinata.

D. 1 + 52 — 54; A. 1 + 39 — 41; P. 1 + 23 — 25; V. 16 v. 17; C.  $\frac{6 + \overline{1 + IX}}{6 + I + VIII}$

M. B. 6; Vertebrae 23 abd. + 22 caud. = 45.

*L. lauta*, Syn. Mad. Fish. in. Trans. Zool. Soc. p. 183.

*Longit.* = 3 — 4 — pedalis = 2 × alt.

*Tempus*, Vere.

*Locus*, in mediis profundis: rarius.

MM. CUVIER and Valenciennes, in the tenth volume of their invaluable *Histoire*, justly remark, that it is singular so large and beautiful a fish as *Lampris guttatus* Retz, the Opah, or King-fish of Pennant, Yarrell, and others, should have escaped the observation of the older Naturalists. It seems still more extraordinary that, in these days of active physical research, a second equally magnificent, and even more abundant species locally, should have remained to be detected in Madeira.

The affinity between the European and Madeiran fish assuredly is very close. It is, however, a strong argument in favour of their specific difference, independent of all others, that *Lampris guttatus*\* appears to be properly a northern fish. It seems to be in the Mediterranean a mere straggler; whilst facts are wanting to enable us to trace it further south in the Atlantic, than the Gulf of Gascony. The Madeiran fish, if not

\* To avoid confusion with the Entomological genus *Lampyrus*, it seems inexpedient to restore the orthography of the generic name, derived from λαμπυρίς a glow-worm or fire-fly: but it should assuredly retain its proper gender.

abundant, is at least a perfectly well-known and regular frequenter of the coast, caught always yearly in its proper season, and sold habitually in the market. It were difficult to account for its re-appearance under these circumstances, after such an interval, on the hypothesis of its specific identity with the European fish.

The existence of a *Lampris guttata* again still further south, rests merely on the vague impressions of a Negro Prince.—See Yarr. Brit. Fishes i. 174; and Cuv. and Val. 10. 47.

In regard to the Madeiran fish, the following description with the accompanying figure, is taken from an individual which measured three feet four inches and a half in length, and which was said to weigh upwards of thirty pounds —

Shape subrhombic rather than oval, deep and short, deepest forwards in a line through the base of the pectoral or commencement of the dorsal fin, the depth here being contained only one thirteenth instead of one quarter more than twice in the whole length: hence it is rather a deeper fish than *Lampris guttatus* Retz, according to MM. Cuvier and Valenciennes's measurements of that fish, taken from a rather smaller individual of only three feet long. The whole body is compressed; yet of considerable thickness forwards at the nape, above the base of the pectoral fins; diminishing, from a thickness there nearly equal to one seventh of the whole length, to one of one twenty-seventh at the root of the tail; which is short, distinct, abruptly contracted behind the ends of the dorsal and anal fins to between one seventh and one eighth of the greatest depth forwards. The thickness at the root of the tail, is to the height at the same, as four to seven. At the origin of the fin, above and beneath, is a curved or lunate transverse cut or dimple, similar to that which exists in many Sharks; and indicating much play or freedom of motion in the caudal fin.

Head small and somewhat pointed; short, but rather longer than in MM. Cuvier and Valenciennes's fish, being one third and five sevenths; instead of one fourth part of the whole length. The whole is remarkably plain and even; reminding one, in the neat packing and arrangement of the maxillaries and opercles, of the Tunny. The profile descends gradually, and in a perfectly straight and even line from the commencement of the dorsal fin to the tip of the rather short and moderately protractile muzzle. This is conspicuously different from the rounded convex general outline, and depression at the origin of the back in the European fish. From the beginning of the dorsal fin down to the nape, the ridge is almost keeled; and from the throat to the ventral fins beneath it is conspicuously so, as if by an internal strong and prominent breast-bone, the edge of which is slightly grooved or channeled. The outline of the throat and breast is rounded, convex (not straight as above); descending as far back as beneath the pectoral fins: it then begins to ascend towards the tail. The top of the head behind the eyes is very broad, but altogether plain, and without sculpture.

The eyes are large, but obviously smaller than in the European fish; their diameter equalling one fifth part only of the length of the head, instead of more than one third part ("plus du tiers" Cuv. and Val.): they are placed above the middle of its height: their orbits are quite plain and flat: all the opercles are the same; unarm'd, entire. The outline of the pre-opercle is obliquely parabolic. The opercle, subopercle, and interopercle form together a large segment of a circle. The nostrils are two small, oblong, simple orifices, placed rather high,

upon a level with the top of the eye, half way between it and the tip of the muzzle.

The mouth and gape are small. The maxillaries are short, not much dilated at their ends, which play within a groove, opening into several cracks or sinuses behind the corners of the mouth, which give more extensibility and freedom to the jaws. Lower jaw longer, and lower lip larger and thicker than the upper; tied down to the jawbone towards the corners of the mouth where it is also broadest, by a single strong cartilage. Both jaws, as well as the palate and whole mouth, are entirely without teeth, and smooth.

Tongue rather narrow, free, distinct, perfectly smooth and even; the pharyngeal plates in the œsophagus only, on dissection, proving to be armed with short, white, recurved conic spines or points: the œsophagus was filled with half-decomposed remains of the softer-coated isopodous Crustaceæ (Sea Woodlice). This smoothness of the whole tongue has since been verified in several more specimens. It seems to afford an obvious distinction from the British fish described by Mr. Harrison in Pennant as having "the tongue thick, resembling that of a man, but rough and thick-set with beards or prickles, pointing backwards, so that anything might easily pass down, but could not easily return back, therefore these might serve instead of teeth to retain its prey."\* By Fleming, the tongue is described to be "thick and rough, with reflected prickles:"† and Yarrell says that it is "thick with rough papillæ pointing backwards, and well calculated to assist in conveying food towards the pharynx."‡ In the Madeiran fish, the pharynx only is thus armed: not only the tongue, but the whole mouth, as far back as can be seen or felt without dissection, being perfectly smooth.

MM. Cuvier and Valenciennes do not describe either the tongue, or the œsophagus, of their fish. They found, however, in the stomach, a great quantity of the remains of the eight-armed Cuttle-fish (*Octopus*); and quote M. Faber as reporting, on the information of the Iceland fishermen, that the *Lampris* pursues trouts. If this difference of food were constant, it might account, perhaps, for a corresponding difference in the tongue, none existing as to teeth. To retain the strong and active Trout or *Octopus*, the reversed prickles or papillæ might be necessary, which were not required to secure the small crustaceæ found in the Madeiran smooth-tongued fish; yet it is plain from the kind of bait employed for its capture, that this last also preys sometimes on other fishes.

Both in the present, and in other individuals, the branchial membrane had assuredly only six rays on each side. The European fish is, both by MM. Cuvier and Valenciennes, and Mr. Yarrell, described as having seven branchial rays; yet Retzius, Faber, and Nilsson, agree in attributing to it only six.

The shoulders and axils of the pectoral fins are plain and even, the humeral and suprascapular bones not being visible externally to the eye.

The dorsal fin begins rather forwarder than it is either figured or described to do by MM. Cuvier and Valenciennes: *i. e.* about opposite the middle of the base of the pectoral fins, instead of "a little behind their hinder edge." It rises at once into a high and falcate point in front, which scarcely equals one-fifth of the whole length of the fish. It descends again almost as abruptly; and then continues in an even line, of nearly equal height, and very low or narrow, scarcely appearing out of the fleshy groove in which it is concealed when collapsed, till just before its end, close to the tail; where it becomes again broader and rounded. The sides of its groove rise gradually higher backwards, and are scaly; the fin itself is altogether naked. The first ray is a very short, thick, indistinct, triangular bone

\* Penn. Brit. Zool. ed. 1776. iii. 224.

† Flem. Brit. Anim. i. 220.

‡ Yarr. Brit. Fish. i. 175.

rather than spine, concealed completely within the skin at the base in front. The second ray is the longest of all, broad, unbranched; the two next rays are forked; the fifth, sixth, and seventh branched; from the seventh to the fifteenth the rays are less and less branched; the twelve next are altogether simple, neither branched nor barred, but still weak and cartilaginous like the rest, and in no degree spiny; the twenty-eight remaining rays again are branched, becoming gradually more and more so towards the end; the last six or eight being double or bifid to the base, and so close together, and confusedly and copiously branched, that it is quite impossible to reckon them correctly without dissection. The lowest even part of the fin, extends from about the fifteenth, to the thirtieth ray; and the height of its broader hinder end is about one sixth of that of the produced part in front.

The anal fin is seated in a similar groove, and corresponds with the hinder low half of the dorsal; beginning opposite its twenty-second or twenty-third ray. It is not produced or elevated at all in front; but is gradually broader backwards, and rounded like the hinder end of the dorsal fin. Its first ray is a short, thick, obscure, triangular bone rather than spine, completely hid and buried in the thick loose skin. The second ray is flexible and slightly branched, but very little longer than the six or seven following ones, which are also scarcely branched. The hinder rays are gradually more branched; the last six or eight being very copiously and confusedly so, and bifid to the base, so as to be with difficulty reckoned. Mr. Yarrell speaks of "a triangular scale pointing backwards," which in the British fish precedes the anal fin. I can find no trace of this, unless it be what I have called above the first ray of the fin.

Pectoral fins placed high up, rather above the middle of the sides; their base, which is a singular peculiarity, being completely horizontal. This is caused, according to MM. Cuvier and Valenciennes (vol. x. p. 56), by the enormous development of the cubital bone. When turned down, the upper side of their base is discovered to be peculiarly tumid, smooth, and naked, covered with a fine, soft, wrinkled, flaccid skin of a metallic lustre, affording them great play in a vertical direction. On dissection, they are found to be curiously articulated to the four carpal bones, by means of four prominent oval knobs or knuckles on their edge, like four small bird's eggs in a row, diminishing in size backwards. The whole is enclosed in a strong capsular ligament; and connecting weaker ligaments, pass also from the interstices of the knuckles to the opposite dissepiments of the cells or cups at the base of the fin, into which they fit. The fin itself is large and falcate, measuring one fourth and a quarter of the entire length of the fish. The first ray is a very short spine; the second is the longest of all, but unbranched and very broad at the base; the third and fourth are bifid half way down; the rest much branched.

The ventral fins resemble the pectorals; they are only a very little shorter, and have no short spine in front, the first ray, answering to the second of the pectoral fins as above described, being simple, and the longest of all. The hinder rays become gradually more and more branched. These fins are articulated to a plain, rounded, even edge of bone; but the skin at their base is soft and finely wrinkled as in the pectorals, forming a curious raised sort of fleshy cushion, contrasting with the rest of the skin, which is remarkably hard and thick, especially towards the head, and keel of the breast, where it is half an inch thick. Their position is apparently abdominal; though on dissection they are found to be really thoracic, or connected with the shoulder-bones, instead of free, as in the truly abdominal fishes. They are inserted close together on the belly, behind its most prominent or deepest part. The base of their first ray falls a little behind a vertical line through the root of the last ray of the pectoral fins; and the distance from the base of their last ray to the origin of the anal fin, scarcely exceeds the



breadth of their base. The anomalous number of their rays, sixteen or seventeen, and want of a true spine, are very peculiar characters.

The caudal fin is simply forked, not lunate, large and powerful. Its forks are broad, but considerably shorter than in *MM. Cuvier* and *Valenciennes's* fish; being only about one fifth, instead of one third, of the entire length of the fish. They are furnished outside with a number of short accessory simple rays, enclosing a broad, rounded, fleshy space. The longest of these reaches to the tip of each fork. The seventeen rays within are copiously branched.

The rays of all the fins are of a substance between cartilaginous and horny; and are curiously compressed, or as it were, planed flat, on each side; the first long unbranched ray of all the fins, except the anal, has the front edge sharp, the hinder edge flat or grooved, and the sides very broad: the whole resembling a scimitar. The other rays of the pectoral, ventral, and caudal fins, and the hinder ones of the dorsal and anal, are branched dichotomously in a peculiarly graceful feathery manner: and so copiously towards the hinder ends of the two first and last, and in the middle of the caudal fin, that the web is quite obliterated.

The scales are small, and soft, or membranous and satiny; extremely deciduous, or rubbing off almost with a touch: hence the more prominent parts, especially the throat, breast-keel, and corresponding ridge of the back are smooth and naked. The head, cheeks, and all the opercles are, however, scaled all over.

The muzzle, lips, and maxillaries, the dorsal, anal, pectoral, and ventral fins are smooth and naked; the caudal fin alone has rows of very bright silver scales, running a considerable way up between the rays.

The lateral line rises at once steeply at its origin; forming an abrupt high arch, under the high fore-part of the dorsal fin, approaching near to the ridge of the back. It then descends, at first abruptly, afterwards more gradually; attaining the middle of the body at about the middle of the dorsal, or beginning of the anal fin; and thence continues in a straight line to its termination. Though sufficiently distinct throughout, it is in no part keeled; and not more elevated towards the tail than forwarder, being formed by short raised lines or marks upon the skin, which are more obvious when the scales are removed.

The colours are truly splendid. When quite fresh and uninjured, the whole body appears covered with a rich brocade of silver and rose or lilac, formed by the scales, reflecting on the middle of the sides golden tints; but pure silver and rose-lilac on the back, silver and more rose than lilac on the belly. The whole sides, cheeks, and opercles, are spotted with round and oval pale or silvery whitish spots, shining through the scales; becoming towards the throat and sides of the breast or belly, irregular and confluent, forming waved mosaic marks or bands. The raised sides of the groove embracing the base of the dorsal and anal fins, and the rows of imbricated scales running up between the rays of the caudal fin, are bright pure silver. The head, opercles, and back reflect bright iridescent ultramarine tints.

On removing the scales, or where they have been worn away by rubbing, the skin is in general of a very dark rusty grey, approaching to black, with a dark bottle-green tinge on the top of the head, shoulders, and forepart of the back, the white spots appearing clearer and brighter silver than before. The naked keel of the breast and throat is dark rose-colour mottled with brownish-black.

The naked muzzle before the eyes, the lips, and lower jaw are rich vermilion. The upper lip and top of the muzzle are tinged with olive-brown; the lower lip and jaw beneath blend into white. The tongue is white, tinged with vermilion. The ends of the maxillaries are silvery.

The iris is clouded with gold and vermilion on a silver ground; the pupil is a bluish-black. The edges of the orbits are dusky brownish.



The fins are the brightest vermilion, as if varnished with red sealing-wax; a little paler and transparent towards the edges. The dorsal, pectoral, and ventral fins are brighter or fuller coloured than the rest; the middle part of the dorsal is shaded with dark olive brown between the rays: and the base of its high fore part and of the pectoral and ventral fins, is coated with a fine smooth bright vermilion skin, obliterating the roots of the rays.

Unfortunately, nothing was noticed of the viscera except the presence of an air-bladder. The vertebrae were short, and their whole number, including as usual that from which originate the caudal rays, was noted down erroneously as it now appears, at forty-nine, which is six more than in MM. Cuvier and Valenciennes's fish. The flesh was red like beef or Tunny, and full of blood, but fine in grain.

The individual above described, was taken off Camera de Lobos, a village three or four miles to the west of Funchal, on the 20th of February 1835. Its fin formula was

$$D. 1 + 54; A. 1 + 39; P. 1 + 25; V. 16; C. \frac{6 + \overline{I + IX}}{6 + \overline{I + VIII}}$$

$$B. M. 6; \text{Vertebrae } 49?$$

In two others taken respectively May 13th, 1836, and March 26th, 1838, the latter of which was said to weigh about one hundred pounds, the fin-formula was

$$D. 1 + 54; A. 1 + 41; P. 1 + 24; V. 17; \text{and}$$

$$D. 1 + 54; A. 1 + 40; P. 1 + 23; V. 17; C. \frac{6 + \overline{I + IX}}{6 + \overline{I + VIII}}$$

$$B. M. 6 \text{ on both sides.}$$

The tongue of both these fishes was quite smooth. The rays of the tail and branchial membrane in the former were not noted. In both there was nothing like a "scale" before the anal fin; and in colours and other general particulars they agreed with the foregoing description. The numbers of the rays were in each case ascertained by maceration and dissection.

The smoothness of the tongue has since been verified in several other individuals.

Since writing the above description, I have had an opportunity of testing it by comparison with another individual, a female, measuring three feet five inches in length: and from which are derived the following particulars:—

The greatest depth of this example was two feet; a quantity contained rather above one quarter less than twice, instead of one-thirteenth more in the whole length of the fish. The head was one foot long, or half the depth exactly; being not quite one third and a half, instead of one third and five sevenths of the whole length. Thus the fish was at once deeper, and had a longer head than the one above described; both characters removing it still further from the European fish

described by MM. Cuvier and Valenciennes. The diameter of the eye was one-fifth of the length of the head. The pectoral fins were rather longer than before; measuring something less than one fourth part, instead of a quarter more than one fourth part of the whole length. The ventral fins were one fourth part, and the high front part of the dorsal fin was scarcely one fifth part of the whole length of the fish. The anal fin was neither raised in front, nor had any trace of "a triangular scale" before it. Not only was the tongue perfectly smooth all the way down, as far back as the pharyngeal plates, but all the bases of the branchial arches are less aculeate than in most fishes, and merely scabrous. The pharyngeal plates at the entrance of the œsophagus or gullet, are six above, and two beneath, furnished with strong, sharp, white, recurved teeth, directed down the throat, which it were scarcely possible to mistake and describe as pertaining to the tongue.

On opening the fish, the small extent, and great apparent height of situation in the body of the abdominal cavity, owing to the enormous depth below it of the breast-bone (cubital), are remarkable. The *viscera* are altogether small in proportion. The air-bladder appeared small and inconspicuous; but having been unfortunately ruptured, its shape could not be ascertained; the liver was rather small, and of a very pale fawn-colour. The stomach was of a most peculiar columnar shape, perfectly cylindric, and of the same diameter with the long œsophagus, elongate, and very obscurely bilobed at the hinder end, one of the lobes being the *pylorus*, which is thus subterminal, and from the neck of which originates an enormous mass of *cæca*, forming a dense compact or fleshy gland, of an oblong shape, and as long as the stomach, with which it is connected closely all its length by cellular tissue; lying parallel to it, and reaching forward to the liver or œsophagus. In colour and consistence it resembles a mass of lung. The intestine is short and simple, issuing from the middle of the mass of *cæca*, and proceeding thence without volution to the vent. The *ovaria* were small and empty.

In this union of the *cæca* into a single fleshy gland, more completely than in the Tunny, there is a curious and unexpected analogy with the Sharks and Sturgeons. In *Lampris*, this organ appears to be completely in an intermediate or transitional state from *Cæca* to *Pancreas* or spleen; just as it does in the Sturgeons or *Sturionidae*.\*

The fin formula, &c. in this example was

$$D. 1 + 52; A. 1 + 4; P. 1 + 24; V. 16; C. \frac{6 + \overline{1 + IX}}{6 + \overline{1 + VII}}$$

M. B. 6; Vert. 24 abd. + 21 caud. = 45; weight eighty-five pounds. It was captured April 25th, 1839.

In another female, taken March the 30th, full of roe, and measuring three feet and half an inch in length,

The depth was exactly half the length: the head ten inches long, or rather more than half the depth, and one-third and three-fifths of the whole length. Thus it was intermediate in these proportions between the first and last examples above described. The eye was a little larger than in either; its diameter being contained only four times and four-ninths in the length of the head, though this last was also rather longer than in the first-described example. The pectoral fins were contained four times, and the ventral fins three and three-fifths in the whole

\* See Cuv. R. An. 2<sup>d</sup> ed. ii. 379, 381, and 384.—Cuv. and Val. Hist. i. 502, 503.

length; the latter being thus a little longer than the pectoral. The high front part of the dorsal fin was also longer than before; being nearer one-fourth than one-fifth part of the whole length. In all other points, external and internal, it agreed with the previous descriptions, with the following exceptions or additions: the ventral fins were not only rather longer, but less falcate or more oblong and obtuse at the tips than usual: the breast-keel was channelled only close before the root of the ventral fins: the sides were of a fuller pink than usual, with the white spots more distinct, and extending over the opercles and cheeks, but not becoming confluent on the sides of the breast. The lateral line made a slight loop downwards immediately before the beginning of its straight part in the middle of the fleshy fore-part of the tail. The air-bladder was elongated, oblong, but not large, with its coats extremely fragile. The liver was large, its lobes narrow, and nearly as long as the stomach which was a foot long, and an inch and half in diameter. Both the œsophagus and stomach were filled with various small soft-coated *Crustaceæ*, and traces of remains of fish. The ovaries were two cylindric masses, nearly as long as the stomach, and turgid with half-formed eggs. The flesh only upon the enormous cubitals was red like beef: the rest was white, and looking delicate enough when boiled; but it was rather dry and insipid to the taste; resembling that of the Dourado (*Coryphæna equisetis*, Linn). The fin-formula, &c. was

$$D. 1 + 52; A. 1 + 40; P. 1 + 24; V. 17; C. \frac{6 + \overline{I + IX}}{6 + \overline{I + VIII}}$$

$$M. B. 6; Vertæ 23 \text{ abd.} + 22 \text{ caud.} = 45.$$

The six last dorsal and the four last anal fin-rays were attached to a single interspinal only, which was spatulate or much dilated at its apex. The hinder ribs are extremely long and crowded; the last two or three being soldered together in their middle, forming a back to the abdominal vault; from the end of which, here as elsewhere, and not from the still more variable position of the first anal interspinal, I reckon the commencement of the caudal vertebræ. In this particular fish, however, from the approximation and variable degree of cohesion of the lower hinder apophysis or ribs, it is not easy to determine which is the first free single apophyses indicating the first true caudal vertebræ. The enormous *cubitus* on each side was a foot high and half as wide: resembling in size a blade-bone of mutton, but extremely thin and laminar. Its lower edge comes down quite to the ventral keel, where it is soldered to the edge of that of the other side. The first regular interspinal of the dorsal fin is attached to the superior apophysis of the first vertebra, which is scarcely shorter than the others: all being remarkably short and equal. The first short ray of the anal fin is attached immediately to the points of the two inferior apophyses or ribs of the fifteenth abdominal vertebra. In front of the dorsal fin there is an interspinal belonging to its first short buried spine, which is unconnected with any process from the vertebra, and free within the flesh upon the nape.

Thus then, besides the points exposed in the specific character, the Madeiran *Lampris* is a deeper fish, with the head longer and the eye smaller, than the European.

There is something about this fish which commands the admiration of the most incurious and unobservant. It is not usual to see great size, and richness without gaudiness of colour, in such combination. The very

fishermen are eloquent in commendation of its splendour in the water ; and by their name, intend to note it as “ the pink ” of beauty.\*

Though not a common fish, it is by no means rarely brought into the market during spring ; and is perfectly well known to all the fishermen. Its flesh is considered superior to that of the Tunny ; selling in the market at a somewhat higher price for the pound. Formerly, I am informed, it was held in such esteem, that every fish taken was obliged by law to be carried to the governor of the Island, without whose licence it could not be sold in the market.

This fish is taken with an ordinary bait, a whole Cavalla (Mackerel), or Chicharro (Madeiran Horse-Mackerel), at no great distance from the shore, but at a depth of from fifty to one hundred fathoms. It is taken only in the early Tunny-season.

The accompanying figure is reduced from a full-sized drawing of the adult individual first above described, measuring three feet four inches and a half in length.

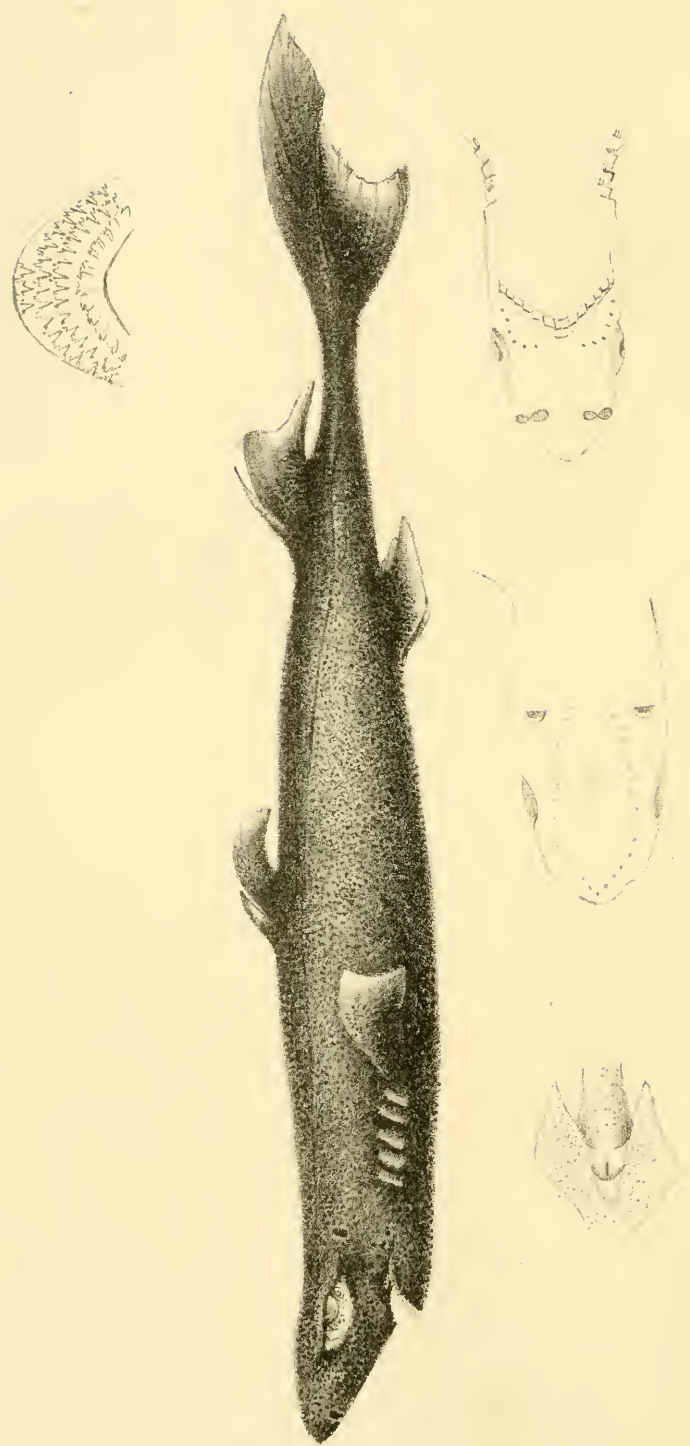
The nature of the fin-rays in *Lampris*, amongst others, considerably affects the verbal precision of the names employed for the two great divisions of the Fishes into Acanthopterygians and Malacopterygians. This fish is, strictly speaking, soft-rayed ; whilst its affinities are unequivocally Acanthopterygious.

\* The Pink or Carnation (“ Cravo,”) is, with the Portuguese florilinguists, the emblem of gentility or beauty.









## TAB. VI.

## ACANTHIDIUM PUSILLUM, NOB.

*Raimudo pequeno, ou Gata negra.*

LITTLE BLACK SPINE-SHARK.

## CHAR. GEN.

Corpus gracile, elongatum. Spiracula magna. Caput fornicatum, subinflatum. Rostrum depressum, obtusum, crassum, subtrilobum; naribus terminalibus. Dentes utriusque maxillæ dispares, parvi; superioris ut in *Scyllis* lanarii s. conico-acuminati, tennes, recti; basi utrinque denticulis aucti; antice triseriati, lateribus biseriati: maxillæ inferioris incisorii, acumine utrinque a medio oblique deflexo, uniseriati. Fissuræ branchiales quinque omnes ante pinnas pectorales. Membrana nictitans nulla.

Pinnæ dorsales duæ, antice spiniferae, spinis recurvis; pinna secunda majore, postica, caudæ approximata. Pinnæ ventrales subpecticae s. secunda dorsali subanteriores. Pinna caudalis lobo superiore majore, producto, oblique oblongo, truncato; gelasino basali nullo. Pinna analis nulla.

*Obs.*—Squali regionis temperatae parvi, nigrescentes, subtus fere nigriores. Genus inter *Spinacem* Cuv. et *Centrinam* Cuv. intermedium.

## CHAR. SPEC.

*A. atrum*, scabro-granulatum; ore fissurisq; branchialibus spiraculisq; intus albis: pinnæ pectorales ventralibus majores.

*A. pusillum*, Suppl. Syn. Mad. Fish. in Proceed. Zool. Soc. 1839, p. 91.

*Centrina*? *nigra*, Proceed. Zool. Soc. 1833, p. 144.—Syn. Mad. Fish. in Trans. Zool. Soc. p. 194.

*Longit.* = 10 — 12 poll.

*Tempus*, per totum annum.

*Locus*, in mediis profundis: rariss.

THE tribe or family of Sharks is part of one of those aberrant groups, which, in the general form and habits of the species, retain many characters of the true fishes; but begin in certain other points of structure to lead off, sometimes to the higher, sometimes to the lower forms or types of animal organisation. The Sharks, speaking restrictively, retain the shape, the gills, the fins of fishes; and are but as it were occasionally, or by accident, like the *Reptilia*, viviparous. Yet even in their outward aspect is there something, which inclines the most cursory observer to hesitate regarding the propriety of classing them amongst the Fishes; a difficulty which, in almost every language, has been indicated by the designation of the tribe by a particular name.

The correctness of this popular view is amply confirmed by the researches of the anatomist and physiologist. Aristotle was the first of these to fix this idea scientifically; and to establish the tribe of τὰ σελάγχη upon the cartilaginous nature of the bones, and the supposed universal viviparous production of the young.\*

The Sharks in common with the Skates or Rays (*Raiidæ*), the Sturgeons (*Sturionidæ*), and the Lampreys (*Petromyzidæ*), forming together the series termed by Cuvier Chondropterygianæ (from χόνδρος, cartilage), are in fact distinguished from the generality of the true fishes by the cartilaginous instead of bony structure of their skeleton; the parts of which are not composed of bony fibres, but of an aggregate of granular calcareous particles, effacing more or less the joints, divisions of the bones, and more especially the sutures of the skull. Considering the class, with Cuvier, rather in the light of a series parallel with the true fishes, than as either of a subordinate, or of a higher rank; for if on one side they degenerate towards the *Invertebrata*, on the other they approximate in certain points of structure to the *Reptilia*; a curious analogy in outward form and certain characters may be traced out between the families or groups of each respective line. Thus in the Chondropterygian Series, or their confines,

Sharks	=	Scombridæ.
Skates and Rays	=	Pleuronectidæ.
Lampreys	=	Muraenidæ or Gobidæ, or Cyclopteridæ.
Sturgeons	=	Syngnathidæ, or Balistidæ.
Balistidæ and Diodontidæ	=	Lophidæ, in the series of the <i>true fishes</i> .

The Sturgeons and the Lampreys agree in this—that they deposit eggs or spawn like the true fishes: but the Sturgeons have the gills or branchiæ free, opening by a single orifice, and covered by an opercle: whilst in the Lampreys the respiratory organs are a row of mere cells, each opening either directly by a distinct orifice on the sides of the neck externally, or into an internal common tube or channel; and the spine is reduced to the lowest state of development, marking the passage from one great division of the animal kingdom (*Vertebrata*), to the other (*Invertebrata* or *Mollusca*). But in the Sharks and Rays, the spine, though cartilaginous, is perfectly continuous and distinct; the branchiæ, as in the sturgeon or the ordinary fishes, are composed of pectinated laminæ, which are not however free, and opening by a single orifice, but fixed or adherent by their outer edge to the integument or skin, and opening on both sides of the neck by as many separate external orifices as there are intervals between each pair; the rays of the fins are indistinguishable: and lastly, many of the species are, as Aristotle thought of all, viviparous; although others, and

\* Confer Arist. Hist. (Schneideri) A. 2, 1. α. 13, ζ. 6, and η.

especially the Rays and Skates, deposit those curious yellow horny cases, like a handbarrow or butcher's tray, often called, on the English coasts, Sea-purses, or Skates'-eggs.

Most of the *Selachidæ* (Sharks and Rays), observed cursorily, appear to the naked eye to be merely granular or rough, and devoid of true imbricated scales. But, when examined with a lens, the roughness of the skin is found with few exceptions to be caused by minute and elegantly formed scales; anomalous in form and structure, but disposed quincuncially like those of ordinary fishes. Many of the Rays, and some few Sharks, are furnished also with large bony scattered dermal tubercles or plates. The substance called Shagreen, or by the French Chagrin,\* is prepared from the coarse-grained skins of certain species of the Shark or Ray: and the rough skins of other sorts are used by cabinet-makers and other artisans for polishing their manufactures.

The Sharks were by Linnæus all united in a single genus *Squalus*; which the accession of new species, and the application of a stricter critical analysis, have obliged later naturalists to raise into the rank of a tribe or family *Squalidæ*, distinguished from the Rays or Skates (*Raidæ*), by the elongated, more or less cylindric form of body, by the fins in figure, size, position, and proportion, corresponding with the ordinary fishes, by the arrangement of the branchial openings on the sides of the neck, and by the lateral position of the eyes. The two families agree with the Sturgeons (*Sturionidæ*) anatomically in having the *caca* united into one mass, forming a sort of *pancreas* or sweetbread,† and the intestine furnished with a curious internal, generally spiral‡ appendage, like the worm of a female or hollow screw: and they accord with each other in the distinction of the sexes by the presence of a pointed cartilaginous appendage, called a clasper, attached to the inner margin of each ventral fin, characterising the male fish from its earliest stage; and in the frequent presence in both sexes of a temporal orifice or breathing hole (spiracle, or in French *évent*) behind each eye, destined, perhaps, in certain positions of the fish, in which the mouth is closed, to admit the water to the branchiæ, or to allow of its expulsion from the mouth, when occupied in holding or in masticating food.

\* These words seem to be derived from the Italian. Willughby says, that Sagree (Ital. *Sagri*) is the common name for *Spinax niger*, Cuv. with the Ligurians or Genevese: and hence its application under different forms of orthography to the skins of other Sharks.

† See under *Lampris louta*, supra p. 33.

‡ In one of the Hammer-fishes (*Zygæna tudes*, Val.) and in another Shark of doubtful genus (*Galeus? thalassinus*, Val.), M. Duvernoy has observed this internal appendage to be a membrane attached longitudinally, instead of spirally, and rolled up cylindrically on itself. He considers it as constituting in these instances a kind of internal mesentery. An analogous structure exists also in the Lampreys. See Ann. des Sciences Nat. 2d Serie, iii. 274. tt. 10, 11 A.

In the common Hammer-fish, the German naturalist Meckel had previously made the same discovery.



The family *Squalidæ* is now composed of a greater mass of genera than the Linnæan genus *Squalus* formerly contained of species. They are characterised by the nature of the teeth, the presence, absence, or position of the spiracles, of one or other of the dorsal or the anal fins, &c. &c.; and appear as well established on these grounds as any of the older genera in other tribes.

Of these new groups, the little Shark exhibited in the accompanying plate represents one of the best marked examples. The characters, however, of this genus have but very recently been recognised; and its claims to such distinction are connected with a maze of singular confusion. Thus, although possessing nothing of the elegance of a *Callanthias*, or of the splendour of a *Lampris*, this *Acanthidium* has become an interesting subject to the selachologist.

The genus *Spinax* of Cuvier was established by its illustrious author on the *Squalus Acanthias*, L.; and in a note he proposes to add to it, with some others, the *Sq. Spinax*, L.

The genus *Acanthias* of Risso is exactly identical in type, extent, and characters with *Spinax*, Cuv.

The *Sq. Spinax*, L. proving, however, to differ generically from the type and characters of *Spinax*, Cuv. (*Acanthias*, Risso), the Prince of Musignano has more lately broken up the Cuvieran genus *Spinax* into two, *Acanthias* and *Spinax*: the former differing only in extent, and not in type or characters, from *Spinax*, Cuv.; the latter founded on the *Sq. Spinax*, L., and identical with *Acanthidium*, Lowe.

The name of *Spinax* must, however, remain fixed to the type and characters to which it was originally assigned by Cuvier, viz. the *Sq. Acanthias*, L. and its true allies: for which *Acanthias* is, moreover, an inconvenient designation, having been previously employed by Risso in a different or wider sense, in which it is a mere synonym of *Spinax*, Cuv.

For the *Sq. Spinax*, L. (*Spinax niger*, Buon.), and its allies, there remains no alternative but to retain the name of *Acanthidium*, proposed in the Proceedings of the Zoological Society for 1839.

The group thus named and constituted, is well represented by the Shark\* here figured: and there is not, perhaps, amongst the Selachidæ one which possesses better claims to such distinction. It forms, in fact, a genus of transition between the older groups of *Spinax*, Cuv., and *Centrina*, Cuv.; possessing, as I long ago remarked,† the elongated form of body of the one, and teeth resembling rather—though it appears not to the extent suggested by Cuvier's account of them in *Centrina*—those of the latter

\* Judging from the descriptions, this *Acanthidium* appears to be sufficiently distinct specifically from *Sq. Spinax*, L. (*Acanthidium Spinax*, nob.): which differs chiefly in its paler colour, hairy skin, the dark-coloured inside of the mouth and breathing apertures, and the smaller pectoral fins.

† Proceed. Zool. Soc. 1833, i. 144.

genus. The position of the second dorsal fin is, speaking strictly, intermediate between that which obtains in either of these genera. It is backwarder than in *Spinax*, Cuv., but rather forwarder than in *Centrina*, Cuv., whilst, in its large size compared with the first dorsal fin, it disagrees with both. The caudal fin resembles that of *Spinax* rather than *Centrina*.

The constancy of these distinctions has now been verified repeatedly in several individuals of this little Shark: and their value in a generic point of view may be considered incidentally and independently confirmed by the proposal of the genus *Spinax*, Buon., upon similar if not the self-same characters, and by its adoption by two authors, who have devoted so much labour and talent to the study of this branch of Ichthyology as MM. Müller and Henle.

The little Shark here figured is very imperfectly known to the fishermen, and must be accounted of excessive rarity. Five or six individuals only have occurred, of which all but one were females. In size, these exhibited a remarkable uniformity: and the fishermen affirm positively, that this Shark does not exceed a foot in length.

The general form is elongated and slender, especially towards the tail: the muzzle, head, and nape are flattened above, but have a swollen, vaulted, or inflated appearance: the body is subprismatic, depressed forwards, slightly convex along the top of the back as far as to the second dorsal fin, the belly forming the broad side of the prism: behind the second dorsal fin the back is faintly channeled: muzzle broad and thick, subtrilobed or triangular, contracting suddenly immediately before the nostrils, just behind which it is broadest, and produced into an intermediate narrower, obtuse, short, thick, terminal lobe: the nostrils being at the anterior face, or partly on the under side, of the two much less distinct and shorter side lobes, and situated rather less than half-way from the tip of the middle lobe to the eye; they are large, distinct, and double or bilobed. Their upper valve is narrow and acuminate; their lower or hinder shorter and triangular. The breadth of the muzzle just behind the nostrils exceeds considerably its length from the fore-corner of the eyes. Eyes very large, oval, with the orbits extending both forwards and backwards into corners considerably beyond the eyeball; the hinder *canthus* is in a vertical line with the mouth, which is situated quite underneath. They have no nictitating membrane. The spiracles are large and conspicuous, semilunar, or half oval; and with an internal, dark-coloured, valvular dissepiment; they are placed on the upper side of the neck or nape, about half the longitudinal diameter of their orbit behind the inner *canthus* of the eyes, and half-way between the tip of the muzzle and the anterior base or origin of the pectoral fins. Branchial slits or openings five: the first is about as far behind the spiracles as these are behind the eye; the last is close before the front base of the pectoral fin, partly below and partly above its level. Mouth semilunar, strongly plaited or wrinkled at the corners, with a smooth sort of narrow underlip. Teeth different in the two jaws; in the upper are three rows in front, two on the sides, of small, sharp-pointed, straight, triangular-acuminate or thorn-shaped teeth; their points directed backwards, and having at their base a small equal toothlet or two on each side; they are placed behind each other, not quincuncially: in the lower jaw there is only a single compact and even row of about forty incisorial somewhat square teeth, the short points of which are abruptly deflexed horizontally, diverging from the centre

or middle tooth towards each corner of the mouth. The tongue is broad and short, quite smooth, pale bluish-grey.

The top of the head is slightly convex, quite plain, but with a small, pale, oblong, smooth spot in the middle between the eyes; which, though observed in two individuals, may perhaps be only the effect of injury or friction. No pores at all are visible about the head, or elsewhere, whilst the individual is fresh; but, after being kept twenty-four hours, the whole head and muzzle, both above and beneath, appear pretty thickly sprinkled with pores, which form, however, no regular figures or pattern, and are very inconspicuous.

Lateral line very indistinct, but straight and simple. A kind of false secondary lateral line extends below it from the upper axil of the pectoral to the ventral fins, where it disappears; and here sometimes begins, a little higher up, on the flanks, another waved line, or rather the dark edge of a deeper-coloured cloud or patch, extending to the caudal fin: but these are merely superficial variable marks or stains.

The skin is all over coarsely granulate or shagreened like sand-paper, and more coarsely on the belly than elsewhere: but it is in no part hispid or hairy. Through the lens the granulations are found to be caused by close-pressed or almost imbedded tricuspidate or dagger-shaped scales; the middle point of which is produced or acuminate, and the side-denticle, or short toothlet at its base, set on at nearly right angles, forming a sort of cross, like the *obelus*, or dagger, used in printing for a mark of reference. The elongated middle point is not in any way produced into a hair or filament.\* Thus there is no appreciable difference between these scales and those of a *Scyllium* as figured by MM. Müller and Henle in their plate of *S. Edwardsii*, except that they are somewhat narrower or more slender and acuminate in proportion to their depth or breadth at the base.

The first dorsal fin is placed half-way between the tip of the muzzle and the origin of the caudal fin; i. e. considerably forwarder than half the whole length of the body and tail together, and nearer to the pectoral than to the ventral fins. It is low, and rather small and narrow, sublunate or oblongo-arcuate, reclining backwards; its front edge furnished with a short, triangular, recumbent, horny spine, about half the height of the fin itself, and grooved on each side.

Half-way between the first dorsal and the origin of the caudal fins, but on the opposite part of the body beneath, are the ventral fins; these are rather small and low, narrow-trapeziform, acuminate behind, and connected by a web both to each other and to the body at their inner edge. Their clasper or appendage in the male is without a spine.

The second dorsal fin begins just opposite the hind tips of the ventral fins, still leaving a considerable space behind it and the beginning of the caudal fin, to which, however, its produced acuminate and slender hinder end nearly reaches. It is much larger than the first dorsal fin; its shape trapeziform and appendiculato-caudate, or with the hinder point produced into a slender sort of tail, and with the outer margin sinuate or with a wide notch. The spine at its anterior edge is long and slender, subpellucid, whitish towards the point, recurved, and shaped as in the first dorsal fin, but twice as long, and reaching nearly to the rounded fore-point of the fin. It is grooved more strongly than the spine of the first dorsal fin, especially at the back; resembling the nail or claw of a bird.

The pectoral fins are broad and truncate, subquadrangular, scarcely twice as long as broad, placed far back from the tip of the muzzle, so that they reach nearly to a line through the commencement of the first dorsal fin. The upper axil of their

\* In his *Spinax niger*, the Prince of Musignano remarks "I tubercoli della pelle sono terminati da una punta filiforme, onde il pesce acquista un'apparenza lanosa."—*Fauna Italica*.

base is immediately behind and just below the top of the last branchial slit, so that the hinder canthus of the mouth is half-way between it and the tip of the muzzle. They are larger than the ventral fins, and about the size of the second dorsal fin without its tail.

The caudal fin is shaped much as in *Galeus vulgaris*, or *Mustelus lævis*, Cuv.; the upper lobe is obliquely oblong, with a projecting border towards the pointed tip behind, and is much longer than the lower lobe, which is triangular and short. There is no dimple at the root of either lobe.

The whole fish is of an uniform coal-black, except the tips and edges of the spines and fins, which are pellucid, pale, or whitish; especially the pectoral fins, the hinder halves of which are nearly colourless. The whole under side and belly are as black as, or even blacker than, the upper side or back. The iris is of a beautiful golden-green dotted with black: the pupil is of an opaline sea-green, reflecting blue in certain lights. The ball of the eye outside the iris, and the inside edges of the orbits, are of a bluish-white, like the interior of the spiracles, and the smooth corners of the mouth.

The length of the pectoral fins equals that of the first dorsal fin, or of the ventral fins; a little exceeding that of the spine of the second dorsal fin; and is from one eleventh to one twelfth of the whole length. The distance from the tip of the snout or muzzle to the last branchial slit or base of the pectorals is one fourth of the same. The greatest breadth is at the anterior base of the pectorals, and is from one ninth to one tenth of the whole length: it equals or exceeds the greatest height, which is backwarder, at the origin of the first dorsal fin. The longitudinal diameter of the orbits equals or exceeds twice the vertical, and is one nineteenth or one twentieth of the whole length of the fish. The first dorsal fin begins at three eighths, the second dorsal at two thirds the distance from the tip of the muzzle to the tip of the caudal fin. The distance from the tip of the snout or muzzle to the spiracles is about one seventh of the whole length. The breadth of the top of the head between the eyes, or of the muzzle, exceeds the length of the latter before the eyes, and is about one twelfth of the whole length. The upper lobe of the tail is one fifth of the same, and twice the length of the lower lobe.

Nothing is known of the habits of this curious little Shark: but, except as limited by size, there is no reason to suppose they disagree with those of others of the tribe. It is captured with a common bait and hook, without confinement to any particular season, though of extremely rare occurrence during any. The individual figured was taken in July, and measured eleven inches and three quarters of an inch in length. Its sex was not particularly noted at the time: but, from the figure, it seems to have been a male. It was deposited, with another individual, a female, in the Collection of the Zoological Society of London.

#### DESCRIPTION OF TAB. VI.

Upper right-hand figure.—Teeth of upper and lower jaws *in situ*.

Lower right-hand figure.—Under side of the head.

Middle lower figure. —Upper side of the head.

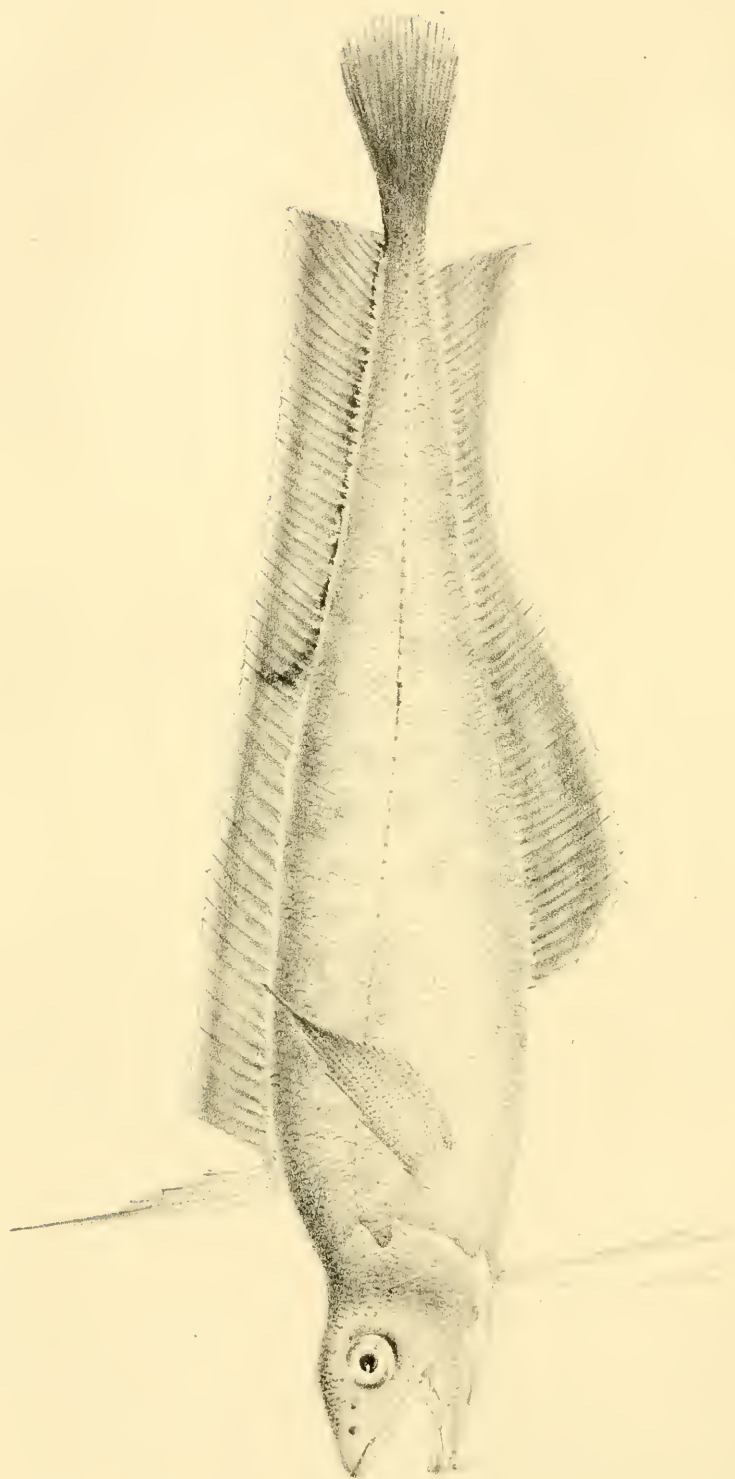
Left-hand lower figure. —Shows the mode in which the ventral fins are united to the body by their inner (hinder) margins. This, and the upper right-hand figure, have been taken from a female example.

All the figures, except that of the teeth, are more or less reduced.









TAB. VII.

PHYCIS YARRELLII, NOB.

*Abrotea do alto.*

YARRELL'S PHYCIS, OR FORKED HAKE.

CHAR. GEN.

Corpus elongatum, postice compressum. Caput depressiusculum; mento uniccirrato. Pinnæ dorsales duæ; prima brevî, triangulari; secunda elongata, ad caudalem fere protensa: ventrales uniradiatæ, radio furcato.

*Obs.*—Genus inter *Gadidas* subaustrale; e paucis speciebus, iisque regionis temperatoris, extratropicæ, coloribus tristioribus, simplicibus, cinereis, fuscis, &c. magnitudinisque mediocris, adhuc constans.

CHAR. SPEC.

P. capite depresso: corpore graciliore, elongato, angusto, pallide lilacino-cinereo; pinnis dorsalibus analique caudalique nigris, albo fimbriatis: dorsalis prima quinquerradiata, acuminata, dorsali secunda postice latiore, angulata, duplo altior; analis medio depressa, antice altior, postice angulata: ventralibus capite subbrevioribus.

1<sup>ma</sup> D. 5; 2<sup>da</sup> D. 59 v. 60; A. 60; P. 22 v. 23; V. 1; C. 20 fere; M. B. 7.

*P. Yarrellii*, Syn. Mad. Fish. 190.

*Longit.* =  $7\frac{1}{2}$  —  $8\frac{1}{2}$  poll. =  $5 \times$  alt.

*Tempus*, vere.

*Locus*, in profundis, e littore procul: rariss.

IN point of general utility, and application to the wants and the necessities of man, the Cod-fish tribe assumes a rank and an importance in the eyes of the economist which is scarcely paralleled by any other. Yielding a wholesome and abundant aliment, whether fresh or cured, the Cod, Ling, Coal-fish, Haddock, Whiting, Hake, and Tusk or Torsk of Shetland, afford, directly in the way of food, or through the various channels of employment or of commerce opened by their means, support or wealth to millions. A bounteous Providence has contributed to this their destination, by endowing them with prodigious powers of fecundity;\* and has further brought them within the sphere of human art and industry by implanting in the greater number of the species a voracity of appetite which much facilitates their capture. Their general confinement to the

\* "Nine millions of ova have been found in the roe of one female" of the common Cod, (*Morrhua vulgaris*, Cuv.) Yarr. Brit. Fish. ii. 148.

temperate regions of the globe is another part of this beneficent arrangement. Had the rich stream of life, which pours its countless myriads around the Dogger-bank, or on the coasts of Northern Europe and America, been diffused among the coral-reefs and islets of the tropics, man's labour had been unavailing to divert any considerable portion of the boon into the lap of industry and wealth.

In this tribe of Malacopterygious, or Soft-finned fishes, the ventral fins are placed, as in the greater number of the *Acanthopterygii*, just beneath or before the pectoral; the bones to which they are internally attached being connected with the shoulder. This disposition, however general amongst the Spiny-finned fishes, serves to distinguish the *Gadidæ* from all the other families of the *Malacopterygii*, except the Flat-fishes (*Pleuronectidæ*), and Sucking-fishes (*Cyclopteridæ* and *Echeneidæ*); the characters of which, however, are so peculiar that there is no risk of confusion. The order which contains these families is termed by Cuvier *Subbrachial*; in allusion to the attachment of the ventrals forward underneath the arms (*brachia*) or pectoral fins, instead of backward on the belly (abdominal), as in the Carp, Pike, Salmon, and Herring tribes.

The *Gadidæ* have always two, and often three dorsal fins; and frequently two anal fins. Their mouth or gape is large, but feebly armed with teeth. Their *cæca* are numerous. They are furnished with a large air-bladder, which in the common Cod is well known by the name of Sound or Zounds, and is often separately cured and packed in small casks as a delicacy for the table. The flesh of nearly all the species is white, flaky, free from toughness, easily digestible, and of excellent flavour. It possesses these qualities most eminently in the colder seasons of the year.

The subject of the present chapter possesses none of these claims to attention. It is both insignificant in size, and of excessive rarity; two examples only having hitherto occurred. It is, however, a most interesting addition, ichthyologically speaking, to a genus of at present few known species, and which, geographically, seems to take the place or mark the boundary which terminates the southern range of the *Gadidæ*: for whilst this family has in the Mediterranean dwindled down to a few, and in Madeira to still fewer representatives, the genus *Phycis* abounds in one or other of its species; of which only one (*P. furcatus*, Flem.) is but occasionally seen in Britain. The common "Abrotea" of Madeira (*Phycis Mediterraneus*, Lar.) is one of the most abundant fishes in the market at all seasons.

The addition, therefore, of a second species to the list of the Madeiran fishes, independent of its novelty and rarity, has been a valuable confirmation to these views; and it was peculiarly gratifying to be enabled, by my friend Mr. Yarrell's examination and discovery of its specific

novelty, to dedicate so elegant and interesting a species to the excellent and able author of the "British Fishes."

Compared with the common "Abrotea" of Madeira (*P. Mediterraneus* Lar.) it is not only a much smaller fish, but is considerably shallower in proportion to its length; the greatest depth, which is from the beginning of the dorsal to that of the anal fin, being only one fifth part, instead of one fourth, of the whole length. The length of the head equals or is very little less than the greatest depth. The greatest thickness, which is on the head and shoulders, or from the eye to the root of the pectoral fins, equals only half the depth: towards the tail the body becomes much more attenuated, slender, and compressed.

Although the mouth and gape are very large, the head is small, considerably depressed below the dorsal line, with a remarkably strong hollow or depression on the nape; rising again, however, into a protuberance over the extremely large eye, which in diameter is one third the length of the head, and is surrounded by a faintly-defined bony ring or ridge. Muzzle prominent: the upper jaw a little longer than the lower, which is furnished with a single short beard or barbule at the tip beneath. Teeth scobinate, or brush-like in both jaws, small and recurved: the outer row in the upper longer and more pointed than the inner, which are blunt and short; none exist upon the ethmoid or vomer. The tongue is short and broad; white at the tip; the rest of the mouth inside and gullet being dark. The whole body is covered with small and inconspicuous scales, which easily rub off, leaving it naked and smooth.

The lateral line is straight and channeled, appearing like an inlaid narrow sort of chain. Its scales are slightly notched or cloven at the tip, with the appearance when *in situ* of a little tubercle or wart rising through the notch at about every fourth scale.

The first dorsal fin is placed very forward, nearly on the nape, just behind its depression. Its height equals or rather exceeds that of the body, and is double that of the second dorsal fin immediately behind it. It is composed of five soft rays; the first of which is the longest, and simple: the four others are gradually shorter and forked; the last is connected to the body behind by a web. Its breadth or rather length at the base equals the diameter of the eye.

The second dorsal fin commences close behind the first, in a vertical line with the upper or anterior axil of the pectoral fins, and extends continuously nearly to the origin of the caudal fin. Its edge is even, but it is slightly depressed or narrower at about two thirds its length from its origin than forwarder; and its hinder end again is broader, ending abruptly in a point or angle caused by the production of the hinder rays, and by the sudden diminution in length of the five or six last of all. The front or fore part is also very slightly higher than the rest.

The anal fin begins opposite the twelfth or fifteenth ray of the second dorsal, ending a little before the termination of the same, and resembling it precisely in shape, but having its peculiarities exhibited in a much stronger manner. It is much higher in front, more depressed in the middle, and with the hinder end more distinctly angular and pointed. Its first ray is very short; the following increasing gradually to the sixth or seventh.

The pectoral fins are narrow, lanceolate, acuminate, placed about one third up the side. They are about the length of the ventral fins, and their tips reach to the origin of the anal fin.

The ventral fins are placed close together quite underneath the throat, considerably in advance of the pectoral fins. They consist each of a single flexible forked ray or filament, without web or membrane, rather shorter than the head, and reaching only to the vent, or not quite to the origin of the anal fin.

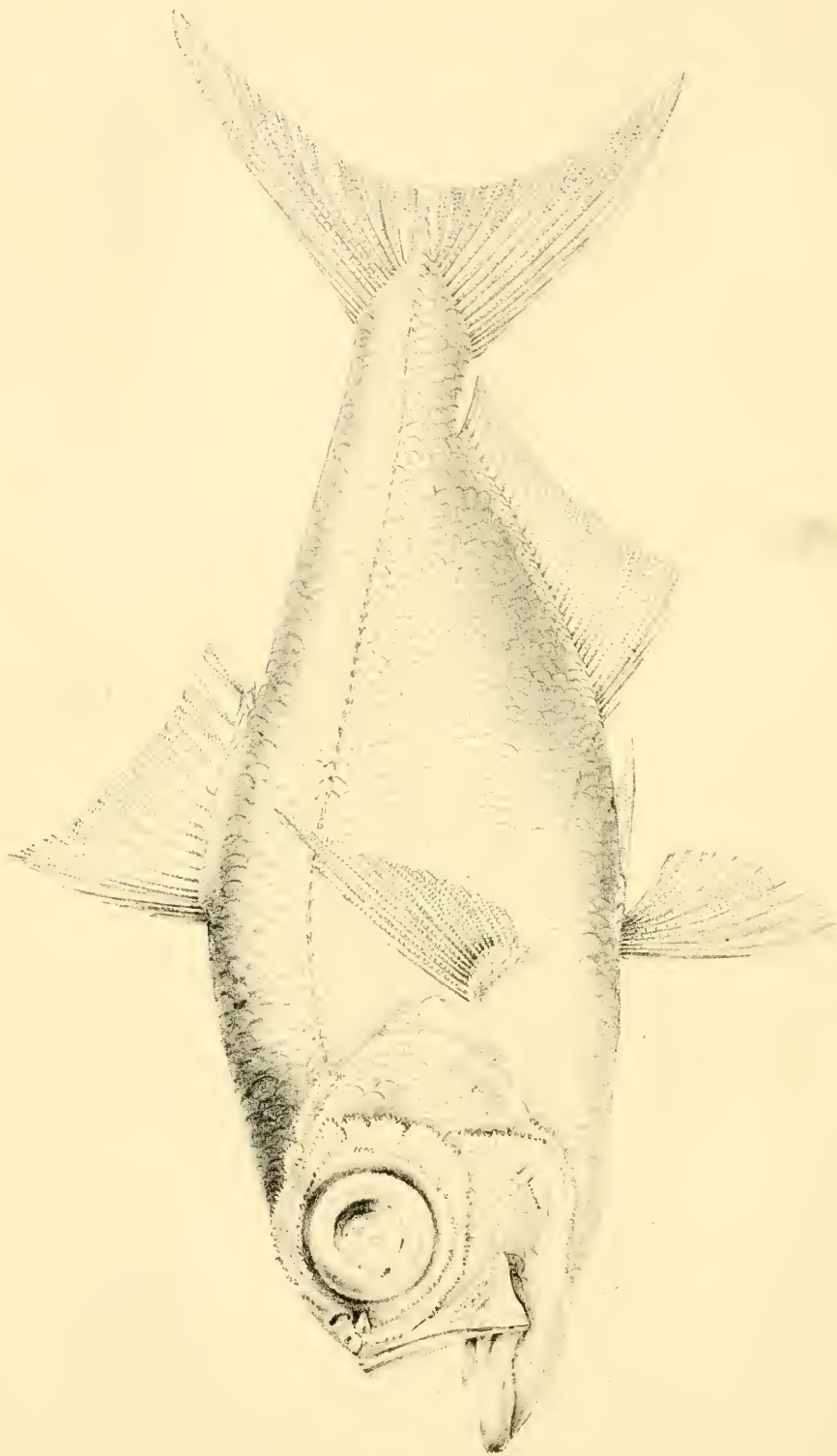


The caudal fin is small, entire, and rounded. The colour of the body is a light greyish brown or ash, a little darker towards the back, and paler towards the belly; with lilac tints, especially along the base of the anal fin. The iris is pale whitish or pearly grey. The lips are dusky. The dorsal, anal, and caudal fins are black, edged with clear white; and the two former also paler at their base. The pectoral fins are purplish brown; the ventral white, or pale ash-colour.

Two individuals only of this pretty species have occurred. The first, from which the accompanying figure was taken, measured eight inches and five eighths in length; the second only seven and five eighths. Both were deposited in the collection of the Zoological Society of London.

The nearest described ally of the species is the forked Hake, *P. furcatus* Flem. (Yarr. Brit. Fish. ii. 201, and Penn. Brit. Zool. ed. 1<sup>ma</sup>, iii. 193, t. 31, No. 82.) From this it is distinguished by its greater slenderness of body and depression of head, by the shape and colour of its vertical fins, and by the short ventral fins. Agreeing in this last point with *P. Mediterraneus* Lar. it differs in the others, and in the elevation of the first dorsal fin compared with the second.





## TAB. VIII.

## BERYX SPLENDENS, NOB.

*Alfonsin.*

## THE OBLONG ALFONSIN, OR BERYX.

## CHAR. GEN.

Caput osseum, armatum, nudum, genis operculoque squamosis, hoc bispinoso, spinis inconspicuis, adpressis: præoperculi nudi interoperculique margine eroso-denticulato. Suborbitaria circulatim cristato-carinata; cristis eroso-denticulatis. Vomer scobinato-dentatus.

Oculi maximi. Pinnæ dorsalis unice triangularis analisque spinæ paucæ confertæ. Pinnæ ventrales multiradiatæ. Membrana branchiostega octo-radiata. Cæca numerosissima, tenuia, in fasciculum prægrandem densissime aggregata.

*Obs.*—Pisces pulchriores, regionis extratropicæ, calidioris, temperatæ; coloribus lætissimis, e rubro roseis lauti.

## CHAR. SPEC.

B. corpore oblongo, altitudine longitudinem capitis haud superante: dorso recto: pinnæ dorsalis abbreviatæ basi pinnis pectoralibus brevior: capite utrinque pone oculos gibboso: operculi lati carina conspicua, distincta: ossis humeralis dilatati margine posteriore arcuato, obliquo.

D. 4 + 13 — 15; V. 1 + 10 — 13 (1 + 11 fere); A. 4 + 26 — 29 (4 + 29 fere);

P. 2 + 15 v. 16; C.  $\frac{5 + \text{I} + \text{IX}}{5 + \text{I} + \text{VIII}}$

M. B. 8; Sq. lin. lat. 71 — 76 v. 73; Vert<sup>æ</sup> 10 abd. + 14 caud. = 24.

*B. splendens*, nob.; Proceed. Zool. Soc. 1833. i. 142.—Cam. Phil. Trans. vi. 1, 197 excl. icon.—Syn. Mad. Fish. 174.

*Longit.* = 1 — 1½ vix 2 — pedalis = 3 — 4 × corporis alt. capitivse longit.

*Tempus*, vere, æstate.

*Locus*, in mediis profundis: vulg.

THE *Berycidae* are a small group of genera, which it is convenient to detach from the true *Percidae*; whose discriminative features they disturb and render vague, whilst they possess amongst themselves a strong resemblance in common, both of characters or habit, and of geographic distribution. They are distinguished by a somewhat short, deep form of body; large head, eyes, gape, and branchial opening; an extremely short blunt muzzle; and by the anormal number of the rays in the ventral fins and branchial membrane. The structure of the head is rather *Sciænid*al than *Percid*al or *Triglidal*; cavernous rather than armed; yet with its bones and ridges crested, prominent, and rough. The dorsal fin seems

normally to be triangular, or high in front, and solitary; its fore, or spiny portion, being much reduced either in its extent, or in the number of its rays, proportionally with the hinder soft-rayed part. The outer edges of the large forked caudal fin are furnished at the base with more distinct and stronger spines than usual; and these, like those belonging to the other fins, are striated or grooved. The scales are very rough or ciliated; and the colours brilliant, yet not varied. Internally the *pylorus* is surrounded by a large thick bunch of generally many *cæca*. The remaining characters are properly Percid; but it may be worth remarking, that, as far as hitherto appears, the focus of their geographic range seems to lie between the twenty-eighth and thirty-fifth degrees of north or south latitude.

The genera associated thus are, in the first place, *Beryx*, Cuv.; *Trachichthys*, Shaw (*Trachichthys* and *Hoplostethus*, Cuv. and Val.); and *Poly-mixia*, nob.: of which the first presents most perfectly the typical and normal characters. Other aberrant and more tropical genera are *Holocentrum*, Cuv.; *Myripristis*, Cuv.; and *Monocentris*, Bl. (*Lepisacanthæ*, Lac.): in which the spiny portion of the dorsal fin reaches the maximum of that developement which it begins to exhibit in *Trachichthys*; although the other characters remain purely Berycidal. Or the family may be conceived as resolving itself into two parallel series: in one of which the dorsal fin is single; in the other double, or at least deeply notched. This division also nearly corresponds with the geographic range of the species; all the tropical kinds belonging to the latter section, and but few of this claiming geographically enumeration in the former.

The proper and distinctive characters of *Berycidae*, expressed in technical form and language, will stand thus:

#### FAM. BERYCIDÆ.

Corpus abbreviatum, altum.

Caput magnum, subcavernosum: ossibus prominulis, nudis, scabris vel serrulatis: hiatu branchiali, ore, oculisque magnis: rostro simo, brevissimo, obtuso: intermaxillaribus palatinisque scobinato-dentatis.

Membranæ branchiostegæ pinnarumque ventralium radii abnormes.

Pinna caudalis radiis primordialibus externis spinosis.

Spinæ pinnarum sæpissime striatæ.

Squamæ asperæ, ciliatæ.

Cæca pluria, fasciculata.

*Obs.*—Pisces magnitudine medioeri, capite monstroso, carioso; coloribus pulchris, sæpissime rubescentibus; in mariis profundioribus regionum calidiorum extra- vel intra-tropicarum degentes.

SS. 1. Pinna dorsalis unica, antice alta.

Gen. *Beryx*, *Trachichthys*, *Polymixia*.

*Obs.*—Species extra-tropicæ.

SS. 2. Pinna dorsalis duplex vel emarginata.

Gen. *Holocentrum*, *Myripristis*, *Monocentris*.

*Obs.*—Species intra- et extra-tropicæ.



In demonstration of the difficulty which has hitherto attended the proper systematic collocation of these fishes, it may be mentioned, that whilst the greater number of the genera, and one species of *Trachichthys*, have been enumerated by MM. Cuvier and Valenciennes amongst *Percidæ*; *Monocentris*, and a second species of *Trachichthys* (*Hoplostethus Mediterraneus*, Cuv. and Val.), are included in the family of the *Triglidae*.

No fishes are perhaps more characteristic of Madeiran ichthyology than the two common species which belong to the typical and central genus, *Beryx*, of this group. Remarkable and striking in appearance, from their enormous opal eyes, and brilliant red or rosy tints, and abundant principally in the spring and summer, though scarcely absent from the market long at any season, they fail not early to attract the notice of the most incurious visitor. The two sorts differ not in season, taste, or quality. They are generally esteemed good table-fishes; their flesh being white, moderately firm, flaky, and well-tasted, though possessing no peculiar delicacy of flavour. They are in highest season in the autumn: their usual size is from twelve to eighteen inches long, weighing from two to five pounds. They are captured only at enormous depths; and though I have been unsuccessful hitherto in obtaining one of either sort in spawn, yet I have reason to believe, from certain observations, that their breeding-season is the autumn.

It is remarkable that fishes so common in a locality so little remote from Europe should not earlier have engaged the ichthyologist's attention. The first notice of one of the species (*B. decadactylus*) is afforded by the illustrious Cuvier; whose acquaintance with it was, it appears, derived from a dried example taken from the Cabinet of Lisbon, to which it may with probability be supposed to have been conveyed from Madeira. MM. Cuvier and Valenciennes remark so lately as the year 1829, in the third volume of their *Histoire*, regarding this example, "Il n'existe à notre disposition aucune note sur son origine; nous ne connaissons ni ses habitudes ni les parages qu'il habite, et nous ne pouvons les espérer que de quelque navigateur assez heureux pour le rencontrer. Son anatomie sera aussi un objet intéressant de recherche." Cuv. et Val. iii. 226.

When, in the years 1833 and 1836, I published *B. splendens* in the Proceedings of the Zoological Society, and Cambridge Philosophical Transactions, I had not discovered the existence of another species in these seas: but by a singular coincidence, which can be scarcely called unfortunate, since it led subsequently to a fresh discovery, the individual selected by Miss Young for a representation in the Cambridge Transactions of *B. splendens*, happened to be one of a sort at that time unknown to me, but which has subsequently proved scarcely less common than the other, and identical with *B. decadactylus* of Cuvier. In colouring and general aspect there is indeed a very strong resemblance between the two Madeiran species; and

although the number of the ventral fin-rays proves inconstant in at least one of the species, so as to afford no ground for its discrimination, other differential characters have been elicited, which I have verified in a vast number of examples of both kinds to be both permanent and easily appreciable, and alike independent of age, sex, or season.

The form of *B. splendens* is oblong, moderately compressed, deepest forwards from the nape to the dorsal fin, contracting considerably at the origin of the caudal; the dorsal line but slightly arched or convex, and descending very little from the origin of the dorsal fin to the tip of the remarkably short muzzle. The ventral line possesses a considerably greater curvature; rising steeply from the breast to the tip of the lower jaw, and again from the origin of the anal to that of the caudal fin; the space between these two points being nearly straight. The greatest height of the body, at the origin of the dorsal fin, varies from one third to one fourth of the entire length from the tip of the closed lower jaw to that of the caudal fin forks; not quite reaching either of these limits. The greatest thickness just behind the eye equals, or very nearly equals, half the greatest height.

The length of the head equals the greatest height of the body, measuring as before. The enormous eye is placed high up, leaving a space below it equal to its own diameter, and a very narrow border above, between it and the outline of the profile of the head. Its diameter is contained about twice and a half in the length of the head.

The muzzle is extremely short and abrupt, not reaching more than half its diameter before the eye. The nostrils are close together, one before the other; the anterior, but scarcely lower one, is round and small; the hinder larger, and more elongated or oval. A strong and prominent short spine or tooth, directed backwards on each side of the muzzle, is given off by the anterior suborbitary just below the lower nostril. The upper jaw is thick and notched in the middle; the intermaxillaries are thin and slender at the sides, and furnished with a rather narrow band of brush-like, very fine and minute, teeth. The palatines and vomer are feebly armed respectively with a very narrow band and small patch of similar teeth.

The lower jaw is thickened and clumsy at the tip, which projects considerably beyond the upper, and is received into its notch. Its edges are furnished with a band of teeth like those of the upper jaw, but much narrower. The branches which compose it are closely approximate, and conceal entirely the branchial membranes. The tongue is free and rather broad, its surface smooth.

Maxillaries broad, and dilated at the ends, which are overlapped by a curious rough and rugged, elongated, moveable, supernumerary plate or bone, the lower edge of which projects abruptly into a roughened angle, which plays into a corresponding hollow on the surface of the maxillary bone, behind a rough projection on the same. Below this loose bone the ends of the maxillaries are quite smooth, with a triangular depression.

The gape, like that of *Uranoscopus* or *Priacanthus*, is singularly oblique; ascending steeply at an angle of more than forty-five degrees; scarcely extending backwards beyond the anterior edge of the eye, but, by its vertical direction, giving an uncouth and strange appearance to the mouth when closed. The ends of the maxillaries reach, however, when the mouth is closed, to about the middle of the eye beneath. Eye surrounded by a naked, punctate, narrow space or border; the upper edge of which, commencing from the spine under the fore nostril, is raised, and, like the lower, finely but irregularly toothed or serrulate. This border is composed of the series of suborbitary bones. Behind the eye it becomes

wider, with similarly toothed, but more waved or indented, crest-like edges; the interior of which passes above the eye forwards to the top of the hind nostril, forming a superciliary crest. The space between this inner crest or ridge and the eye-ball is filled with a peculiarly smooth, and jelly-like skin. Another crest or ridge, commencing on the top of the head, in a line with the fore corner of the eye, runs parallel with and above this superciliary ridge, and descends behind the eye obliquely towards the superscapulary, which is a large, plain, smooth, and simple oblong scale, half covered by the opercle, with an entire central keel, and its edge finely toothed and membranous. Thus the space between the eyes, which equals about a semi-diameter of the eye, and is nearly flat, presents four crests or ridges, viz. one superciliary and one temporal on each side, diverging from the top of the muzzle before the eyes, and inclosing on the middle of the skull an oblong or elliptic space.

Preopercle very broad and naked, punctate, irregularly and minutely toothed at the edge, and with two conspicuous little ridges or crests upon its surface at its lower angle: its hinder edge is also faintly striated, and straight; its lower margin curvilinear and convex. A triangular patch of large scales covers the cheek beneath the eye and immediately behind the broad ends of the maxillaries; this patch is bordered behind, or separated from the naked preopercle, by a faintly-toothed slight crest or ridge. The opercle is only twice as high as wide or long, scaled all over, and very gibbous or prominent at its upper part or articulation with the temporal bone close behind the eye; whence also there runs a distinct horizontal or longitudinal bony keel, conspicuous to the eye, though partly overlapped by scales, and so not prominent to the touch, ending in a marginal flat tooth or spine; and below this a second smaller tooth, or angle at the edge, is traceable; the rest of the margin being thin and membranous, with its edge entire. The interopercle is quite naked; its edge convexo-arcuate, striate, and irregularly and minutely toothed. It is short and broad, but nearly concealed by the lower border of the preopercle; leaving scarcely more than the edge of it exposed.

Whole head and lower jaw, except the cheeks and opercle, perfectly naked, or free from scales. The space between the branches of the lower jaw is divided into compartments by three longitudinal bony ridges of unequal length; and these are rough, like the ridges of the bones themselves.

Branchial opening extremely large and wide, extending forwards to the fore edge of the eye. The membrane normally has eight distinct strong rays, and very rarely, and but accidentally, nine,—as in the example originally described in the Proceedings of the Zoological Society.

The humeral bone forms in the axil of the pectoral fins a broad, dilated, triangular, conspicuous, smooth and naked space, the hinder edge of which is arcuate or rounded.

The scales are large, and their whole exposed surface is echinulate, with short reflexed points or prickles, giving a general roughness to the touch. The lateral line, which is nearly straight, following the curvature of the back, at about one quarter of the greatest depth below the dorsal line, is not very conspicuous, and composed of from seventy-one to seventy-six or seventy-eight marked scales. These are continued beyond the others into a curious imbricated point reaching to the tip of the middle short caudal rays. The other scales are all arranged in straight, perfectly parallel lines, visible to the eye; which, from their contrast with the curvature of the belly, give a very peculiar character to the fish, and confuse the lateral line to the eye. There are about eight rows above, and twenty below, the lateral line.

Pectoral fin placed about one third of the height up the side, long, lanceolate,

acuminate ; equalling one fifth of the whole length of the fish. The rays are regular and slender ; the two first unbranched ; the third, or first branched ray, the longest.

Ventral fins placed a little behind the pectoral, their first ray being on a line with the hinder end of their base. They are ovate, triangular, large and broad, but shorter and less pointed than the pectoral ; their length only equalling one sixth of the entire length. Reclined, their tips reach scarcely to, or not beyond, the first rays of the anal fin. Their first ray or spine is strong, pungent, and strongly ribbed or grooved longitudinally ; it is from half to three fourths the length of the first branched or soft ray, which also is the longest ray. These soft rays vary in number from ten to thirteen ; but eleven is the number in the great majority of individuals. Sometimes they vary in the two ventral fins of the same fish : one example had twelve soft rays in the right fin, and thirteen in the left ; another, eleven in the right, and twelve in the left. Individuals with only ten soft rays are the most uncommon ; and I have not yet met with any example having thirteen soft rays in both the ventral fins. Three or four elongated narrow scales form a slight imbricated ridge, or appendage, at their anterior axil. Their last or hinder soft ray is free ; and often the last two or three are simple or unbranched.

The dorsal fin is single, placed on the middle or most convex part of the back, at about an equal distance from the tip of the muzzle and the base of the caudal fin, and occupying the space opposite that which lies between the end of the base of the ventral, and the beginning of the anal fin. It is triangular, and high in front ; its greatest height equalling half the depth of the body beneath. The length of its base is always less than the length of the pectoral fins, and varies from one eighth to one sixth of the entire length. Its anterior rays are thickly crowded ; the hinder gradually more remote. The four first rays are spiny, strong, and longitudinally grooved or striated. The first soft ray, which also is the longest of all, is generally simple or unbranched : the last is forked to the base, or double. The base is hidden in a groove, the scales of which become more pointed, and extend a little beyond the base at the hinder end ; but the fin itself is altogether bare of scales, or naked.

The anal fin begins opposite the termination of the base of the dorsal ; and except in being considerably longer in extent, though lower in front, resembles perfectly the dorsal fin in structure. It reaches nearly to the base of the caudal fin, which the point of its last double ray actually attains. Its spines are strong and striated ; and twenty-nine appears to be the normal number of its soft rays.

The web in front of both the dorsal and the anal fins is curiously wrinkled longitudinally, or across the intervals between the spines or rays towards their base ; in the manner figured by MM. Cuvier and Valenciennes in *Plectropoma puella*, Cuv. and Val. t. 37.

The caudal fin is deeply forked ; the forks long, narrow, nearly equal, pointed ; each furnished at its outer base with a number of accessory, short, adpressed spines, which are strong and pungent, and are grooved or striate longitudinally, like those of the other fins. The middle rays between the forks are very short ; and the intervals between all the rays are covered by a single row of fine, membranous, imbricated scales, running up nearly to their tips ; but very different from those upon the body, which end abruptly in a triangle or semicircle, at the base of the caudal fin.

The colour of the back, fins, head, except the cheeks, of the lips, tongue, inside of mouth, and throat or gullet, is an uniform deep rich scarlet, passing on the sides through iridescent tints of rose-colour and lilac into delicate pale silvery rose. The scaled opercle and the cheeks are iridescent rose and scarlet ; the suborbitaries, the preopercle, the interopercle, the compartments of the lower jaw, and the hume-



ral plate, are silvery and scarlet, punctate with red dots. The upper part of the eyeball is stained of a deep rich indigo or violet hue, forming a conspicuous dark sort of narrow eyebrow. The iris is scarlet and silvery iridescent. The pupil pale opal, with a brassy or pale golden lustre.

The dorsal and the caudal fins are deeper scarlet than the others, particularly towards the tips of the rays; which in all the fins are deeper-coloured than their subpellucid web.

The usual size of this species is from ten to sixteen or eighteen inches; and large individuals are less common than in *B. decadactylus*, Cuv. One, however, measured twenty-three inches in length, weighing five pounds and three quarters.

One singular distinction which exists between this fish and *B. decadactylus*, Cuv. is the comparatively rapid decomposition of the *viscera*. I have repeatedly had individuals of both sorts brought for examination, which had been caught together; and whilst the whole contents of the abdomen in *B. decadactylus* have been in the most perfect preservation, those of *B. splendens*, though in other respects the fishes were quite fresh, have proved entirely decomposed. And I have only been able to overcome this difficulty by going out in the fishing-boats, and being present at the actual capture of this latter species, the “*Alfonsin a casta cumprida*” of the fishermen; which begins to be met with of small size at the depth of one hundred and fifty or two hundred fathoms, but is scarcely taken in full size and plenty except with its congener, *B. decadactylus*, Cuv., the “*Alfonsin a casta larga*,” at the enormous depth of from three to four hundred fathoms, and from one to two leagues from shore.

On opening the abdomen, the mass of *viscera* is small compared with its cavity; the peritoneal lining of which is dark or black. The liver is pale, and small, with the lobes short: the gall-bladder is rather large, distinct, elliptic, with a short duct, not reaching beyond the lobes of the liver. The stomach is small or of moderate size, white, and oblong; with its ascending branch large in diameter, and originating exactly from its middle. *Cæca* from twenty-five to thirty, slender, free, distinct, forming two flat palmate fascicles, but set in a single row round the *pylorus*, with a pair sometimes lower down. They are white or pale, unequal in length, some reaching nearly to the vent, but in general of moderate length. The intestine is pale, and of moderate diameter and length, making only one rather short volution or two bends, and then going straight to the vent. The air-bladder is of moderate size, oblong-oval, and attached all its length to the spinal column, from which it is not separable without rupture. In several female individuals, examined anatomically thus in August, the ovaries were rather large, distinct, short, and pear-shaped; but yet empty, and with little or no appearance of vascularity. Within five or six hours after death, the *cæca* by decomposition become confused and indeterminable.

The first of the abdominal vertebrae next the head is very short,—reduced to a mere ring; the five last are furnished with remarkably large and strong, trigonal, broad, distinct, and widely divergent *apophyses* beneath.

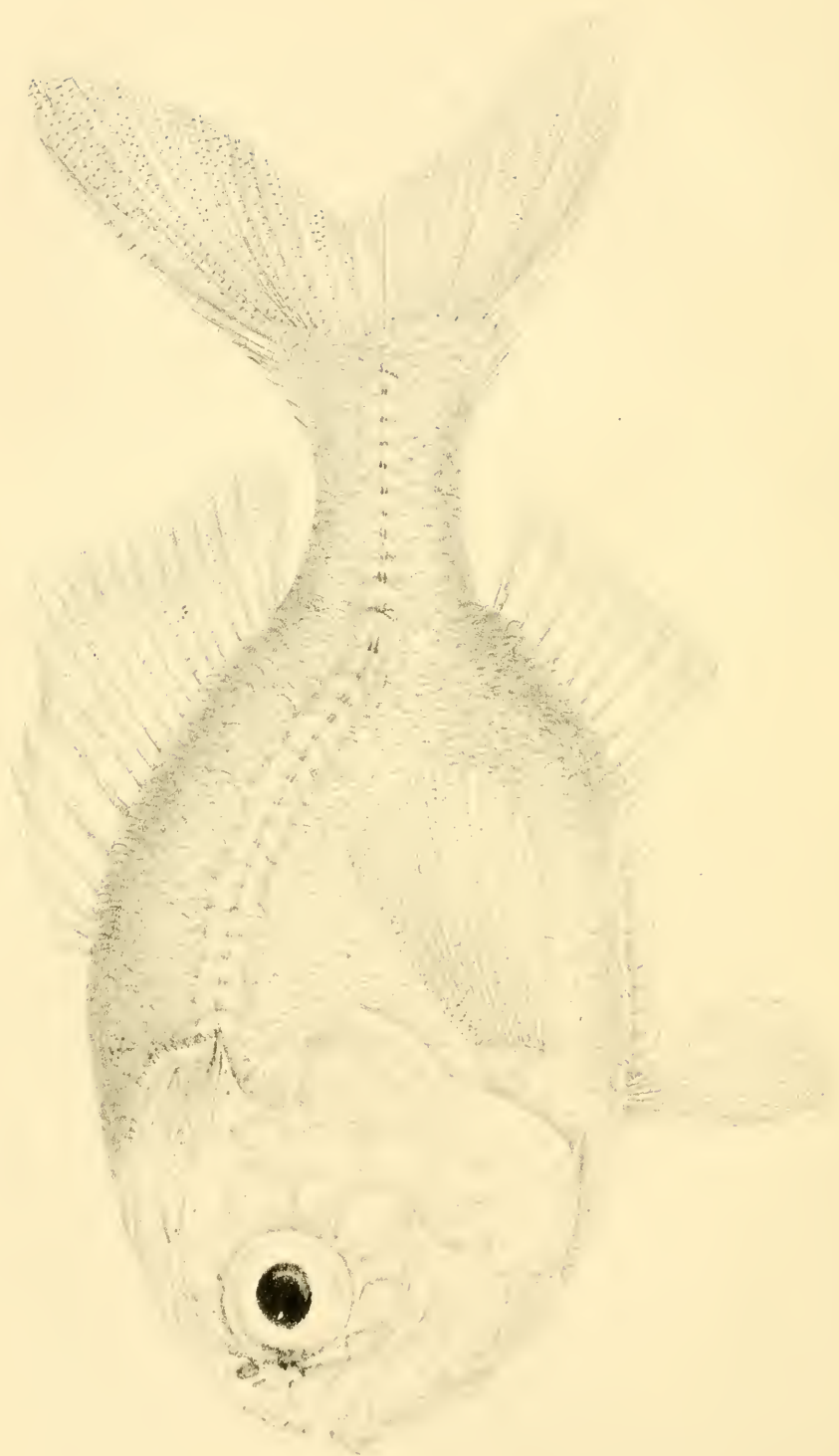


At the moment of capture, whilst this fish is yet alive, the whole body beneath the lateral line is of a pure, resplendent, silvery white: the fins alone, and merely the ridge of the back and head, the inside of the mouth, the lower jaw, and parts beneath the eye, being of the brightest scarlet, contrasting strongly with the pure silver of the whole sides and belly, which only after death turn iridescent-rosy, or sometimes rich golden-scarlet. The hind parts of the dorsal and the ventral fins are transparent: the iris is pale scarlet. There is a watery transparency about the scarlet of the back in this state, perfectly inimitable by art.

The fishermen affirm correctly, that this superior degree of whiteness when first captured, is constant in this species, their “*Alfonsin a casta cumprida*,” as compared with *B. decadactylus*, Cuv., their “*Alfonsin a casta larga*,” which is from the first more generally scarlet or high-coloured. It is also remarkable that the pale-coloured mouth is characteristic of the outwardly richer-coloured species; whilst in the paler, *B. splendens*, the mouth internally is full bright red. This character is constant, and should not have been left out in the specific character.

The accompanying figure is reduced from a drawing of an individual which measured seventeen inches in length, and had only ten soft rays in each ventral fin.





T. 9. C. E. C. A. Thal & Se

## TAB. IX.

## TRACHICHTHYS PRETIOSUS, NOB.

*Alfonsin, ou Pargo, do alto.*

BLACK-MOUTHED ALFONSIN OR ROUGH-FISH.

## CHAR. GEN.

Caput osseum, cariosum, celluloso-cavernosum, nudum; operculum inerme; spina scapularis magna. Præoperculum basi in spinam validam productum. Suborbitaria radiato-costata; costis scabris. Abdomen scutellis serrato-carinatum.

Oculi magni. Pinnæ dorsalis unicæ subtriangularis spinæ paucae, remotiusculæ; membrana distincta interjecta. Pinnæ ventrales hetero-(1 + 6)-radiatæ. Membrana branchiostega octo-radiata.

*Obs.*—Pisces regionis calidioris temperatæ extratropicæ, *Berycibus* simillimi; coloribus mœstioribus; spina baseos præoperculi pinnæque dorsalis forma ad *Holocentrum* tendentes. Linea lateralis squamis majoribus subpulvinatis distincta. Carinæ abdominalis capitisque structura vere mirifica.

## CHAR. SPEC.

T. scaber; carinæ abdominalis squamis integerrimis, pinnarumque spinis striatis inermibus, lævigatis; dentium fasciis angustis; vomere inermi.

D. 6 + 13; A. 3 + 9; V. 1 + 6; P. 2 + 13 v. 14; C.  $\frac{8 + \overline{I + IX.}}{8 + \overline{I + VIII.}}$

M.B. 8; Sq. lin. lat. 28 v. 29; Sq. carinæ abdom. 11 v. 13; Vertæ. 11 abd. + 15 caud. = 26.

*T. pretiosus*, Suppl. Fish. Mad. in Proceed. Zool. Soc. 1839. p. 77.

*Hoplostethus Mediterraneus*, Cuv. and Val. iv. 469, t. 97 bis.

*Longit.* =  $7\frac{1}{2}$  — 8 poll. =  $2\frac{1}{2}$  — 3 × corporis alt.

*Tempus*, vere, autumno.

*Locus*, in alto: rariss.

THE first notice of this curious and interesting genus is found in a description by Shaw, towards the end of the last century, of a fish procured by White, the author of a Voyage to New South Wales, in that country. This appeared, accompanied with a good characteristic figure, under the head of *Trachichthys australis*, in the Naturalist's Miscellany, t. 378; and was afterwards republished in the same author's General Zoology, vol. iv. part 2, p. 631, t. 92. By Schneider the fish had previously been taken up from the original figure and description, and inserted in his edition of Bloch's Systema Ichthyologiæ, as a species of *Amphiprion*, under the name of *A. carinatus*. It also had appeared meantime again, under its original name, in Turton's Translation of Gmelin's Systema, vol. i. p. 820.

And lastly, in the year 1829, it was included by MM. Cuvier and Valenciennes in the third volume of their *Histoire*, p. 229, under the name imposed, and with an exact and faithful abstract of the characters assigned, by its original describer in his text and figure; whilst its proper place as to affinity is no less accurately for the first time indicated, by its collocation next to *Beryx*, in the Cuvieran family *Percidæ*.

It is to be regretted that on the discovery of a second species of this genus at Nice, in the summer of the same year 1829, these last-named authors should not at once have admitted its congeneric affinity with *Trachichthys australis*, Shaw; instead of placing it under a new generic appellation (*Hoplostethus*), in another family, *Triglidae*. The mere presence or absence of teeth upon the *vomer*, were in either fish, considering their affinities, a very unimportant character; and the cheek assuredly is not more cuirassed in one of these fishes than in the other. Nor is it again more so in either, or in *Monocentris*, although this is also placed by MM. Cuvier and Valenciennes amongst *Triglidae*, than in many other genera placed by these authors notwithstanding, like *Trachichthys*, in *Percidæ*.

In fact, these ichthyologists have not only themselves remarked the resemblance of their *Hoplostethus Mediterraneus* with the Percidal genus *Myripristis*, but proceed to say, “Au reste, tout nous porte à croire maintenant que le *Trachichte* de la Nouvelle-Hollande, dont nous avons parlé d’après Shaw dans notre troisième volume (p. 229), est du même genre que notre *Hoplostèthe*; il en a la forme, les épines scapulaire et preoperculaire, les nombres de rayons aux ouïes et aux ventrales, la carène dentée sous le ventre; seulement cette carène est plus forte, et la dorsale et l’anale sont plus courtes, plus hautes, et plus pointues. Si, ce que nous avons tout lieu de le penser, sa joue est cuirassée et son vomer dépourvu de dents,\* il devra être réuni à notre *Hoplostèthe*, et alors nous supprimerons ce nom générique, et nous appellerons l’espèce actuelle *Trachichthys Mediterraneus*.”—Cuv. et Val. Hist. iv. 470.

These observations are most just; and it is only the conclusion from them which appears objectionable. The fish to which they refer might have been called at once *Trachichthys Mediterraneus*: but now, the discovery of three individuals of the same species in these Atlantic seas requires also that, for which the suppression of the needless new generic name *Hoplostethus* has afforded a proper opportunity,—namely, the abandonment of the inappropriate proposed specific name of *Mediterraneus*. The species never has been actually called *Trachichthys Mediterraneus*; a proposal cannot claim the paramount authority of a precedent; and it may safely be affirmed that MM. Cuvier and Valenciennes would never have declared even their intention so to designate their fish, had they been aware of its occurrence as an oceanic species.

\* The *vomer* proves to be toothed: but this is altogether immaterial to the point in question.



In the preceding history of *Beryx splendens*, t. 8, there will be found sufficient to clear up the above-noticed inconsistencies of system, and to explain the true affinities of *Trachichthys* in respect to other genera and families. If allied on one hand to *Triglida*, it seems much more closely so with the *Percidæ* through *Diploprion* and *Apogon*. With *Holocentrum*, in the second subdivision of its own family *Berycida*, it assimilates in the basal spine of its preopercle; a character in which it also shows an analogy with the Percidal genus *Priacanthus*. With *Scienida*, as reformed,\* its natural connexion is but slender; depending chiefly on the trifling, artificial character of a sometimes unarmed *vomer*, and the still less discriminative one of the cavernous head-bones. But of the three families, *Percidæ*, *Triglida*, and *Scienida*, as defined by Cuvier, it may be confessed that, apart from its affinity to *Beryx*, it were not easy to discover on what principle it should be placed in one, in preference to the others. Hence is it that, in fact, two species of the genus have been actually placed by MM. Cuvier and Valenciennes in two of these families. It may be hoped that the formation of the family *Berycida* will dispel this ambiguity.

In *Trachichthys*, as in *Beryx*, we have a curious instance of apparent limitation of the species to the same parallels of latitude, although on different sides of the equator, and separated by enormous intervals of distance on the surface of the globe. Even within these limits, these fishes must be considered of the greatest rarity. The researches of later naturalists have never yet recovered, in Australia, the kind described by Shaw; and even in the comparatively well-explored Mediterranean, only a single example of the other has been taken. And although in Madeira, through the assiduous vigilance of Mr. Leacock, I have succeeded in obtaining three examples, the fishermen are generally unacquainted with it; and its Portuguese name, like that of several others of like rarity, is merely that applied to it by its particular captor, and of no general authority. I have derived its English name directly from its scientific ( $\tau\epsilon\alpha\chi\upsilon\varsigma$  rough, and  $\iota\chi\theta\upsilon\varsigma$  a fish), combined with an obvious peculiarity, likely to assist subsequent collectors in its acquisition. I obtained my second example by directing the fishermen to look out carefully for a black-mouthed Alfonsin: “um Alfonsin com a boca preta.”

I have proceeded all along on the assumption that *T. pretiosus* is distinct specifically from *T. australis*, Shaw: but Ichthyologists will be better satisfied with the assurance afforded on this point by the high authority of Mr. Gray; who, at my instance, has re-examined Dr. Shaw's original specimen, fortunately still existent in the British Museum, kindly transmitting to me the results. These perfectly confirm the differences previously made out from Shaw's figure and description; with

\* See Introduction, p. ix.

which they will be brought together at the end of the following description of *T. pretiosus*, composed from the three Madeiran individuals above mentioned, which were of nearly equal size, and differed only in the greater depth and more oval form of body in the smaller individual, from which the figure has been taken.

The general aspect of this fish in form and colouring resembles strongly that of *Beryx*; though the serrate keel of the abdomen, and the internally black mouth and tongue, serve instantly for its discrimination; whilst the general tone of colouring is far less brilliant, and the body of a dirtier, duller, paler red. The shape, without the tail, is oval, more or less inclined to oblong; but deep proportionately to its length, and moderately compressed. The individual figured was so much deeper, more compact, and rounded in its form of body than that represented by MM. Cuvier and Valenciennes, t. 97 *bis*, that I was inclined to doubt for some time its specific identity. The second and third larger individuals exhibit, however, a form of body, and degree of curvature of the belly, precisely intermediate between the two. The back in either case is arched, high, and convex, of equal curvature throughout, ascending equally and regularly from the tip of the muzzle to the origin of the dorsal fin, and thence again descending in like manner, and for an equal distance, to the termination of the same. The belly either offers, as in the figure, a corresponding curvature, or is more straight and flattened from the breast to the origin of the anal fin. The fleshy part of the tail, behind the ends of the dorsal and the anal fins, is considerably produced and elongated.

The greatest height of the body at the commencement of the dorsal fin varies accordingly from the proportion of one to two and a half, to that of one to nearly three, in reference to the whole length of the fish. The greatest thickness from the eyes to the shoulders, is to the greatest depth as one to two and a half or three: but in the smaller and more oval fish, as one to seven and a half; and in the others, as one to seven, in proportion to the whole length. The length of the head, which is nearly the same as its height vertically through the middle of the eye, is not equal to the greatest depth of the body; being from one to three and two-thirds, to one to three and one third, in proportion to the whole length. The eye is very large; equalling or even a little exceeding\* one third of the length of the head. It is placed high up; the space below it equalling once and a half its own diameter, and that above it half its diameter. The space between the eyes is convex, and scarcely equals their diameter.

The muzzle is very short, abrupt, and convex, extending only about a semidiameter of the eyes before them; it is retuse or notched in front, for the reception of the tip of the lower jaw. The nostrils are two rather large, but simple, oval orifices, placed close together, and separated merely by a dissepiment, just at the fore-corner of the eyes. The fore-nostril is only half the size of the hinder. Although the mouth seems rather small, the gape is very large and subprotractile; and is directed upwards still more steeply than in *Beryx*. The maxillaries reach backwards, when the mouth is closed, to a line drawn vertically through the hinder edges of the eyes. Their ends are broad, dilated, and triangular; incapable of passing, even partly, under the suborbital; and provided with a superimposed, striated, and moveable plate or bone, as in *Beryx*, covering their upper side, and leaving bare the lower corner, which is plain and even, except the raised rim or border along its front edge.

\* In two examples the diameter of the eye is contained exactly three times; in the third and largest, only twice and four sevenths, in the length of the head.

The lower jaw is furnished at the tip with a prominent hard tubercle, and so projects a little beyond the upper. Both are roughened round the edges with narrow bands of fine, small, brush-like teeth, narrowest in the upper jaw: the *vomer*, like the *ethmoid*, is perfectly unarmed and smooth; but the *palatines* are furnished with a narrow, but distinct band of minute teeth. The gullet is rough: the tongue quite smooth, distinct, large, thick, blunt, free; and, like the whole inside of the mouth and gullet, black.

The eye, for at least two thirds of its circumference, proceeding from its fore-corner underneath, is surrounded by a series of five or six flattened, winged or dilated, crest-like ribs or ridges, radiating from the edges of the orbit like the spokes of a wheel. They are of variable length, but all of equal height, appearing just as if they had been ground down to the same level; and dividing the suborbital region into cellular compartments.

The branchial opening is large and wide; its membrane is supported by eight distinct rays, which are finely rough or serrulate. At its lower angle is a prominent flat tooth, formed by the termination of the ends or branches of the lower jaw, and in a line below the ends of the maxillaries.

The opercle is small and narrow, twice as high as broad, with a short, transverse, serrate keel or ridge towards the top, assuredly not ending in a spine, but in a mere point or angle. From the same point from which originates this ridge, there also radiates a number of strong, oblique, descending, scabrous ribs or striae, roughening the whole. The edge is sinuous, and minutely serrulate.

The subopercle is distinct, and large comparatively with the opercle, forming below the keel or ridge of the latter the whole hinder edge of the branchial opening. Its edge descends obliquely, rapidly, from just above the pectoral fins, forming a sinus just before their base. It is faintly striated towards its upper broader part or edge; the striae radiating or diverging upwards from a point below. Its whole edge is membranaceous, thin, and perfectly entire.

The interopercle forms a convex quadrant of a circle, joining on to the subopercle, on a level with the base of the pectoral fins, and reaching to the prominent tooth or angle which terminates the branches of the lower jaw. It is remarkably broad and short; but in great part concealed by the overlaying spine and lower angle of the preopercle, leaving exposed only a narrow border, which is striated transversely, having the edge minutely, feebly, and irregularly denticulate. I find no trace of its being "*singulièrement échancré dans son milieu*," Cuv. and Val.: but this expression has arisen, probably, from not distinguishing it from the subopercle. Considered as forming one piece with that bone, there is indeed a remarkable sinus "*dans son milieu*:" but this is formed by the contraction of the subopercle and interopercle at their junction, close before the base of the pectoral fin.

The preopercle terminates below in a strong, conspicuous, flattened, horizontal spine; the lower edge of which is straight, and finely serrulate. Its border is nearly vertical and straight, formed by two parallel raised ribs or ridges, like *Apogon*; of which the hinder, which is its true edge, is minutely serrulate towards the bottom. This border is divided equally into four oblong cells, by as many transverse dissepiments; the two middle ones of which appear like continuations of two of the hinder suborbital bony ridges, but are spurious or merely membranous: the two extreme ones are true bony partitions.

The whole head, and the opercles, lower jaw, and maxillaries, are completely free from scales, or naked, except a small and narrow, oblong, inconspicuous patch under the cheeks, just behind the dilated ends of the maxillaries.

The whole structure of the head is highly curious; being excavated, as it were, into cellular compartments, separated by rough bony crests or ridges, radiating



like the spokes of a wheel from the eye on the suborbitaries, crossing at right angles the double limb or border of the preopercle, and forming on the top of the head three elongated, lozenge-shaped compartments, placed in a triangle; two in front and temporal, and each divided across in the middle by a spurious or membranous dissepiment; the third behind, and on the middle of the skull between the eyes. Also upon the lower jaw there are two elongated cells, placed one before the other, on each side; the first is small and short, the hinder long. These cells are hollow, and covered by a perfectly pellucid, glassy membrane, like goldbeater's-skin, stretched tight and flat, as in a drum, over each, on a level with their bony walls; through this transparent skin is seen their bottom, coated, especially in the suborbitaries and the border of the preopercle, with a bright, silvery, and iridescent lining, contrasting beautifully, whilst the fish is fresh, with the reddish bony ridges or prominent divisions of the cells; which are all of the same level, and round the eye are irregularly or unequally dilated or expanded at their top, as if winged; appearing exactly as if they had been artificially ground down to an uniform height or level with the skin. They are also very rough or granulate. The whole head has a decomposed or carious appearance, even when quite fresh.

The crests or ridges on the top of the head are thus distributed. High up at the top of the nape originate two, which first a little diverge, and then again converge, forming the central lozenge above mentioned. From their point of meeting, which is on a line with the anterior edge of the orbit, they advance a little way conjoined, and, then separating, terminate each in a distinct prominent point or tooth in the middle of the muzzle; from which a branch turns backwards on each side to meet another bony point or tooth at the upper anterior canthus of the orbit, placed just at the upper corner, and behind the hinder nostril. From this point again, proceeding backwards, spring two branches; one forming the upper part of the orbit, the other rising higher, and completing the temporal lozenges above mentioned, by nearly meeting the ridge of the central lozenge at its widest part. From this point this upper branch forks into two branches, which, first diverging, again unite, so as to inclose an elliptic cell, and terminate in a rough, subulate, flattened spine, a little above the considerably longer *superscapular* spine. The upper of these two spines, by MM. Cuvier and Valenciennes considered as belonging to the *mastoid*, forms the central crest of the large, elliptic, pellucid, *superscapular* cell upon the shoulder, just above the origin of the lateral line. The *superscapular* spine lies along the lower edge of this cell, exactly over the commencement of the lateral line. It is similarly rough and serrulate, but more conspicuous and strong; though again weaker than the basal preopercular spine.

The *humeral* is a distinct, triangular, rough plate in the upper axil of the pectoral fins; its hinder angle is very blunt and rounded.

The pectoral fins are large, and placed at about one fourth of its height up the side. Instead of being lanceolate and acuminate, as in *Beryx*, they are spatulate or wedge-shaped, and peculiarly blunt and rounded, or even truncate at the tips. Their length is contained four and a half times in that of the whole fish; and they reach backwards a little beyond the origin of the anal fin. Their first ray is short and simple; weak, and not pungent, yet spinose: the second longer and articulate, or barred, but simple. The next ten or eleven are of nearly equal length, and branched and barred as usual; the second and third last only being abruptly shorter.

The ventral fins are just beneath, and shorter than the pectoral, being about one sixth of the whole length, obovate, and rounded at the tip. Their spine or first ray is remarkably strong, broad, thick, nearly as long as the soft rays, and striated or strongly grooved in a longitudinal direction. The six branched rays are

also very strong and distinct, with a broad web between each ; the last is free, or not connected to the body by a web behind.

The dorsal fin begins a little behind a line with the base of the pectorals, just on the highest part or middle of the back ; and extends back to the end of the oval part of the body, or commencement of the fleshy root of the tail. The length of its base is nearly double its greatest height or breadth at the commencement of the soft-rayed part, and is from one third to one fourth of the whole length of the fish. The spinous fore-part is shorter than the hinder soft-rayed portion ; but its spines, though few, and striate longitudinally, are not crowded, as in *Beryx*, but sufficiently remote as usual, and separated by a distinct connecting web, which is deeply notched\* between them. They gradually increase in length, proceeding backwards ; and owing to the sublateral attachment of the web, so frequent in the *Sparidae*, one or two of the spines, which are six in number, appear much stronger on alternate sides than the rest, viz. the third and fifth on the left side, and fourth and sixth on the right. The soft part is composed of thirteen rays, and is abruptly higher in front ; the four first rays being the longest, and of nearly equal length. The following rays are gradually shorter ; the two last again a little longer than those immediately preceding ; the last of all, or thirteenth, being free behind, and deeply forked or double.

The anal fin is short, and rather broad, or about twice as long as deep, corresponding in extent with the soft-rayed portion of the dorsal fin, and ending at the opposite point. The three spines are strong, and longitudinally striated or grooved : the first is very short ; the third is three or four times the length of the second. The nine soft rays are of nearly equal length, and about one quarter longer than the third spine ; the last is free behind, and double, or deeply forked to the base.

The caudal fin is very large and deeply forked ; its forks are nearly equal, long and broad, more rounded at the tips than usual, and furnished at the base outside, like *Beryx*, with six or eight short, stout, striate, glassy spines. The next two rays inside these are simple, but articulated and not pungent ; the innermost of them reaches to the tips of the forks. The scales terminate abruptly at the base of the fin ; not running up between the rays.

The spines of all the other fins are also glassy towards their tips.

The whole of the fins, like the head with the slight exception before mentioned, are entirely naked or free from scales. The base of the dorsal and anal fins is seated in a shallow groove. The soft rays of all the fins are finely echinulate or rough ; but the spines are smooth, and unarmed with spinules or prickles.

The whole body is covered up to the point of the throat with remarkably rough and scabrous, deep but short, and close-set scales : those of the lateral line are very large and conspicuous, scutellate, and raised or bossed in their middle. The lateral line itself is raised and prominent throughout, but not more so on the flanks, or sides of the tail, than forward. It begins at the supercapillary spine, at about one fourth part of the whole depth below the back ; and, following the curvature of the back, descends gradually to the middle of the body at the end of the dorsal or anal fins, whence it continues straight to its end. It is composed of twenty-eight or twenty-nine scales.

One of these scales of the lateral line, taken below the origin of the dorsal fin, is found when removed from the body, to be narrow, but excessively produced upwards and downwards into two long obtuse wings. The middle part is lobed, or prominent at the front and hinder margins ; and has a curious superimposed miniature model of the whole scale itself, similarly winged, forming the upper vault of a wide bullate tube, which perforates the scale obliquely in its middle,

\* The accompanying figure errs in this respect.



and opens upon the anterior lobe on the upper, and beneath the hinder lobe on the under surface. The exposed part of the whole is thickly retro-echinulate; and the hinder edges, both of the superimposed and principal subjacent lamina, are pectinato-ciliate. The covered parts, about two thirds of the whole, are quite smooth, and finely sinuato-striate. The depth of one of these scales is equal to two or three times its length or width.

The ordinary scales, above and below the lateral line at the same point, are not half so large, and are simple or not winged, but irregularly oblong vertically; with both the front and hinder edges straight, not lobed; the latter being pectinato-ciliate. Their exposed part, which is from a half to one third of the whole, is retro-echinulate; and the length or width of the scale is about three fifths of its height. Those on the flanks and towards the belly are less echinulate or rough than those above and near the lateral line.

The scaled part terminates forwards, on the top of the head or nape, in a pair of scales placed a little apart, and in advance of the rest; each furnished with a rough, central, longitudinal crest or keel joining on to, and continuing backwards the two central crests or ridges of the skull.

There remains only to be described the curious ventral keel. This commences between the root of the ventral fins, whence it extends to, and terminates at, the vent. It is a prominent, simple, serrate keel, composed in two examples of eleven, and in the third of thirteen scales of a peculiar structure, resembling those of the abdominal keel in the Herring; having two lateral wings embracing the edge of the abdomen, and a strong, sharp, middle glassy point or short spine directed backward, and lying in an imbricated manner. These points and scales are nearly quite smooth and entire, or only here and there echinulate, or armed with small lateral teeth or spinules on their surfaces and edges; not regularly rough and serrulate, as figured in *Trachichthys australis*, Shaw.

All the prominent bones, spines, crests, ridges, or angles about the head are either striated, or rough and scabrous. The cells on the shoulders, nape, and top of the head are punctate.

The general colour varies from pale claret, with the flanks and belly blackish, to a dull, muddy scarlet, fuller and more rosy above the lateral line, with brighter tints of pink or crimson about the top of the head and nape, especially above the eyes; paler and somewhat silvery towards the belly. The whole body is suffused and obscured with a greyish muddy or dirty tint, particularly on the sides of the breast and belly; where it is caused, apparently, by the shining through of a black or dark peritoneum. The ridge of the back, along the base of the dorsal fin, is also darker-muddy than the rest. The crests and ridges about the head are, on the contrary, clearer red; the bottom of the cells on the cheeks or sides of the head, and border of the preopercle, of the brightest pearly-silver. The iris is, while fresh, greenish-iridescent and opaline, with dusky-brown clouds; presently becoming uniform pearly-silver. The whole inside of the opercles or branchial opening, like the mouth, the tongue, and gullet, deep mulberry-black.

The fins are brighter or clearer scarlet than the body; paler and transparent towards the edges, and the rays deeper coloured generally than the web, especially in the dorsal and caudal fins.

The following observations were made on the anatomy and osteology of a female individual, taken on the 29th of October 1839; which although in spawn, and larger than the others, was the dullest in its colouring; being rather vinous or claret-brown than scarlet, except the fins.

On opening the abdomen, the sides or parietes of which are, as in *Beryx*, peculiarly thin, and tending rapidly to decomposition, the whole *peritoneum* and stomach, like the tongue and inside of the gullet, mouth, and branchial opening, are found to be deep shining black. The liver is of middle size; the gall-bladder large; the stomach small; and the intestine small and short. The *cæca* are numerous, but slender, short, and inconspicuous; and like the intestine, pale or yellowish. The air-bladder was large, simple, ovoid, blunt at both ends, without any communication with the *œsophagus*, and pearly-white. MM. Cuvier and Valenciennes speak of it as small. In this example, however, measuring only eight inches and three eighths in length, it was an inch long or more. The *ovaria* were distinct and rather large or turgid, but the eggs were very small and imperfect. The abdominal cavity is very large; but, as in *Beryx*, the mass of *viscera* is small.

These characters, it may be observed, corroborate completely the affinity with *Beryx* of *Trachichthys*.

On clearing away the membranes or integuments about the head, there is found to be externally no fleshy muscle, except at the small scaly patch behind the ends of the maxillaries; *i. e.* below the suborbital: and the two middle transverse dissepiments of the preopercular border, like those of the two elliptic cells over the eyes, are found to be spurious or merely membranous. The uppermost and lowest dissepiments, however, of the preopercular border are bony; and the lowest, especially, is much dilated or broadly winged, and granulo-striate vertically.

The radiating striæ of the opercle are very strong, and rather elevated ribs than striæ. They are beautifully and finely pectinato-denticulate, like all the crests and ridges on the top of the head.

The supracapulary is of the usual structure, *viz.* a large elliptic plate, with the hinder edge finely toothed; forming the base of the large elliptic cell before described close above the origin of the lateral line, and bordered along its lower edge by a strong rough ridge ending in a sharp spine, directed a little obliquely downwards, or along the lateral line. Over the middle of this supracapulary cell lies the dilated ridge or spine which MM. Cuvier and Valenciennes have called *mastoid*; but which belongs rather to the system designated by these authors, (*Hist.* i. 338), after M. Bakker *supertemporal*. It is loose and moveable, as if merely dermal; and is quite distinct from the true *mastoid*, although joining on to it behind, outside the junction of the supracapulary with the same.\*

\* Since the above was printed, I have been favoured by Professor Owen with the following confirmation of this view: accompanied with such profound and original observations on the whole subject of these long misunderstood external ossicles in Fishes, that I must solicit his indulgence for the liberty of enriching these pages by their transcription. In a letter dated "Royal College of Surgeons, April 8th 1840," he observes, "After a careful comparison of your skeleton of the *Trachichthys* with those of other fishes in the Hunterian Collection, I have come to your conclusion, *viz.* that the bone in question represents the supplemental series constituting the supratemporal chain. It undoubtedly intervenes between the *Supracapular* of Cuvier and the *mastoid*, as correctly marked by you. It is a part of the same system of bones with the suborbital chain; and like them supports the vertical ridge with the expanded granular peripheral plate.

"The skeleton of fishes includes two systems of ossified parts: one peripheral or dermal; the other central. The latter is the typical skeleton of the Vertebrates; the former a part of the prevailing skeleton of the Invertebrates: and it is the intercalation of a remnant of the dermo-skeleton with the true vertebrate endo-skeleton that gives rise to such apparent complexity in the osseous

There are twenty-six vertebræ, of which fifteen are caudal, with imperfect approaches towards the formation of a sixteenth. Though all the vertebræ are very short, the first of the eleven abdominal is not peculiarly so. The six last abdominal are furnished with apophyses beneath; those of the four last being united at the base into a thick stalk, forked at the apex. The first interspinal of the anal fin is applied to the inferior apophysis of the first caudal vertebra. The two first interspinals belonging to the dorsal fin, are both received between the superior apophyses of the second and third cervical or abdominal vertebræ: but the rest behind alternate regularly with the superior apophyses: and there are two interspinals before the dorsal fin without rays or external indications; the first applied to the front point of the superior apophysis of the first vertebræ; the second inserted between the points of the first and second.

A most curious analogy, to say the least, exists between *Trachichthys* and the extraordinary Azorian *Sternoptyx Olfersii*, Cuv. R. Anim. ii. 316, t. 13. f. 2; a fish which has been evidently placed improperly in the same genus with the tropical West Indian *Sternoptyx Hermannii*, and which might be appropriately called *Pleurothyris*\* *Olfersii*. The shape, large eye, peculiar tooth at the hinder end of the branches of the lower jaw, the double border of the preopercle, the thinness and partial transparency of the flanks and belly,† in which it approximates to the true *Sternoptyx Hermannii*, and the form lastly of the fins, all correspond. But above all, the peculiar plates of the abdominal keel in *Trachichthys* have their perfect counterpart or representation, even in number, in the plaits or pits which suggested first the name *Sterno-*

system of Fishes, and which at the same time, before the principle was recognised, led to so many forced analogies on the part of those Anatomists, who imagined that every bone in the skeleton of a fish had its homologue in the endo-skeleton of the higher Vertebrates. It was the skeleton of the Sturgeon which opened my eyes to the nature of the difficulties of ichthyic osteology: and which clearly indicates the limits between the dermal and the central or vertebral system of bones. All the true vertebrate skeleton in that fish is in its embryonic state of cartilage: all the dermal parts are well ossified. Here you have the opercular system of bones, the suprascapular of Cuvier, and the suborbitals, in their true character of expanded and ossified scales — a part of the same system which is continued along the lateral line — and above the peripheral extremities of the true spinous elements of the vertebræ. Cuvier's *humeral* is, according to this view, the true scapular; his *scapular*, the suprascapular; and his *suprascapular*, one of the anterior scales of the lateral line, to which the opercular system belongs. The suborbital and supratemporal chains of ossicles belong to the same uncertain and variable system.

"I have taught this doctrine, in opposition to the Geoffroyan views of the opercular bones being the expanded ossicles of the ear, &c. (necessarily flowing from the idea of the whole skeleton of the fish belonging to the true vertebral system) for the last eight years: and I find that Agassiz maintains similar views in one of his recent Numbers of the *Poissons Fossiles*. It is the only clue to the intelligibility of the fish's skeleton: and it demonstrates the soundness of Cuvier's judgment and comparison, that though he had not clearly apprehended the idea, he was not seduced to consider the dermal bones as analogous to parts of the skeleton of the higher Vertebrates (with one or two exceptions); but indicated them as peculiar ichthyic developments."

\* Πλευρά the side, and Θύρα a window.

† This is also common to *Beryx*; and, indeed, a thinness of the abdominal parietes seems a character of most deep-sea fishes.

*ptyx*. Indeed the whole resemblance is most marvellous; and its complete investigation may lead, perhaps, to more correct ideas of the affinities of these singular little fishes than can be gathered from their present forced and artificial place amongst the *Salmonidæ*. They may prove merely aberrant forms of *Berycidæ*.

*Trachichthys australis*, Shaw, appears, from the figure and description, to have the eye proportionately larger (its diameter equalling half, instead of one-third the length of the head); the superscapular spine is stronger than the basal preopercular; and the pointed scales forming the abdominal keel are only eight in number, and are represented serrated instead of entire. The fin formula, so far as can be ascertained, is D. 4 + 10; A. 3 + 9; V. 1 + 6; M. B. about 8. In other points it more resembles the Madeiran, than even the Mediterranean fish, figured by MM. Cuvier and Valenciennes.

The prompt kindness, however, of Mr. Gray, of the British Museum, enables me to add the following decisive particulars:—"I have the pleasure to inform you," writes this zealous naturalist, in a letter dated 3rd of September 1839, "that we have Dr. Shaw's specimen of *Trachichthys australis* in the Museum Collection. It is not in a very perfect state, the end of the vertical fins and one of the lobes of the tail having been destroyed. It is very like *Hoplostethus Mediterraneus* of Cuvier, but is quite distinct from it. It is much shorter compared with its height; and the scales of the whole body, the ridges of the head, and the whole of the rays of the fins, spinous as well as soft, are covered with small spines; giving it a very rough appearance. It is the roughness of the keel of the ventral plates which gives them the appearance of being serrulated. There are only three, or four at most, spines in front of the dorsal; and the dorsal and anal fins are shorter than in the Nice species. The (super) scapular spine is much longer, rough, and subdivided. Our specimen has a broad band of velvet-like teeth on the intermaxillaries; and a similar, but not quite so broad a band parallel to these within them, which are separated from each other by a small triangular group of teeth in the centre (in front) between their ends."

By a subjoined sketch, these inner bands of teeth are evidently *palatal*, and the triangular group *vomerine*. This latter fact does not indeed correspond with the anticipations of MM. Cuvier and Valenciennes (see p. 56 supra); but it cannot disturb the generic relation of the Australian, and Mediterranean or Madeiran fishes. It is only another instance, like that of *Therapon*, and many others, of the little generic value due to the character of an armed or unarmed *vomer*.

It may be well to specify, that MM. Cuvier and Valenciennes' description of the Mediterranean fish, is at variance with the Madeiran, mainly in the following points:—In *Hoplostethus Mediterraneus*, the keel or ridge at the

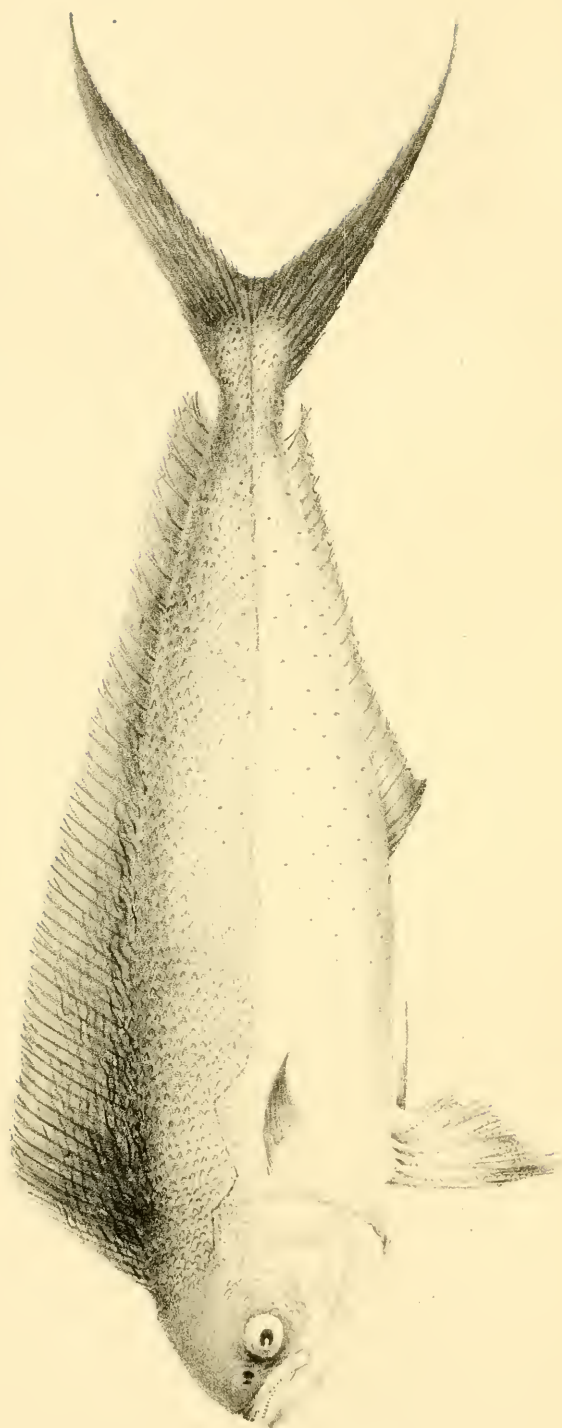


top of the opercle ended in a spine, there was no true tongue (?), the interopercle was remarkably notched, the pectoral fins were proportionably longer, and the soft part of the dorsal fin was not higher than the rest in front.

The accompanying figure is taken from the deeper or more ovate, and smallest, of the three individuals above described, measuring seven inches and a half in length. The second, measuring seven inches and seven eighths of an inch in length, was exactly intermediate in form between this figure and that of MM. Cuvier and Valenciennes, having the ventral line less prominent than the former. The third, or female individual above noticed, was eight inches and three eighths of an inch long, in shape agreeing with the second. The three were captured respectively on the 30th of August, the 1st of February, and the 29th of October.







T 10. R. T. L. del. M. Y. Sc.

## TAB. X.

## CORYPHÆNA EQUISETIS, Cuv. and VAL.

*Dourada fêmea.*

SMALL SPECKED DOLPHIN, OR DORADO.

## CHAR. GEN.

Corpus elongatum, squamulosum. Caput fronte abrupte elevata, declivi: oculis demissis, obliquis, ad canthos oris approximatis: lingua, vomere, et palatinis scobinato-dentatis. Pinna dorsalis antice altior, a nucha ad caudam fere continua, rivuloso-venosa.

*Obs.*—Pisces majores, subtropici, pelagici, navium sequaces, chalybeio-plumbei, flavo loti, moribundi pulchre citoque versicolores.

## CHAR. SPEC.

C. linea frontali semi-perpendiculari: pinnis pectoralibus brevissimis, falcatis: lateribus sparsim arenulis minimis atris raris aspersis, cætera immaculatis.

D. 53 — 58; A. 2 v. 3 + 23 v. 24; P. 2 + 18 v. 19; V. 1 + 5; C.  $\frac{7 \text{ v. } 8 + \text{VIII.}}{6 \text{ v. } 7 + \text{VII.}}$

M. B. 7; Vertæ. 13 v. 14 abd. + 20 v. 19 caud. = 33.

*C. equisetis*, Cuv. and Val. ix. 297. t. 267.—Suppl. Syn. Fish. Mad. p. 31.

*C. Equisetis*, Linn. Syst. i. 447, (excl. syn. Maregr.).

*C. Lessonii*, Cuv. and Val. IX. 307?

*Longit.*  $1\frac{1}{2}$  — bipedalis =  $4\frac{1}{2}$  — 5 × alt.

*Tempus*, æstate, autumnò.

*Locus*, in alto: vulg.

THE *Coryphænida*, or Dorados, form a well-marked group or family. They are, by Cuvier, united with the Mackerels, or *Scombrida*; but their separation now appears desirable, both on account of the present overgrown extent of that enormous family, and the disturbance which their comprehension in it causes to a clear expression of its characters. Their own peculiarities, moreover, admit of a sufficiently precise distinctive definition, and are in accordance with certain obvious points of natural resemblance, of geographic range, and habit. Their close alliance with the true *Scombrida*, and the gradual blending of their lines of demarcation at the points of contact, are at once admitted. But this last is not allowed to be a valid argument in favour of their union; for it would equally apply to sanction a proposal for mixing up into one mass, as each becomes more studied and extended, almost every group, division, family, or genus, which has been established by the naturalist in organized creation.

It may be once for all affirmed, that good arguments against the

establishment of any group or genus in particular are not to be sought out in the aberrant or transitional outskirts of that group; but in the paucity, the indistinctness, or the insufficiency of the characters exhibited by its normal type or centre. It is an error in reasoning to do so, similar to that which would confound in language the words "land" and "sea," because it is not possible, upon a flat, indented shore, to mark by any straight fixed line the limits of the oscillating tides. It is strange that, even at this day, naturalists should often seem forgetful of so palpable a truth; and merge so frequently, what they admit in theory,—the mere practical use and nature of their systems.

The genera which it is proposed to associate under the name of *Coryphænida*, or the Dolphin-tribe, are *Coryphæna*, L. Cuv.; *Lampugus*, Cuv.; *Pompilus*, Rond. (*Centrolophus*, Lac.; *Leirus*, nob.); *Seserinus*, Cuv.; *Apolectus*, Cuv. and Val.; *Kurtus*, Bloch?\*; *Stromateus*, L.; *Peprilus*, Cuv. (*Rhombus*, Lac. Val.); *Lampris*, Retz; *Mene*, Lac.†; *Brama*, Bl.‡; *Pteraclis*, Gron.; *Asteroderma*, Bon. (*Diana*, Risso); and *Luvarus*, Raf. (*Ausonia*, Risso); which brings the series round again to *Coryphæna*. The group, thus constituted circularly, touches, and at the point of contact blends through *Scorpiis* into the *Chatodontidæ*: whilst it affords precisely analogous phases of form, from elongated to deep and short, observable in the true *Scombridæ*.

The Dorados or Dolphins, as they have been called in modern times, which are the typical fishes of this group, have, for the last two centuries, been celebrated amongst voyagers and sailors for the beauty of the changing iridescent tints, which pass in rapid alternation over the body of the animal in its expiring convulsions. The name of Dolphin appears to have been first applied to these fishes by the Dutch; very erroneously, if intended to indicate their identity with the Dolphin (δελφίς) of the ancients; which is clearly described by Aristotle§ as a cetaceous animal, and is undoubtedly the *Delphinus delphis*, L.; distinguished from the Porpoise, the "Bouto," or, when young, "Tunina" of Madeira (*D. phocaena*, L.), by its long, pointed, beak-like muzzle. By naturalists they have more accurately been supposed to repre-

\* This genus, so remarkable for the structure of the ribs, and externally for the short dorsal fin, appears analogous to the genus *Pempheris*, placed by Cuvier in *Chatodontidæ*, but which is rather a Percoid genus, near *Pomatomus*, Risso, and at least nearer allied to *Berycidæ* than to *Chatodontidæ*; although I conceive more so in the way of analogy than of true affinity.

† I cannot any longer follow Cuvier in associating these two genera (*Lampris* and *Mene*) with *Zeus*.

‡ Placed by Cuvier in *Chatodontidæ*.

§ Aristotle's δελφίς was cetaceous and viviparous (Hist. A. δ. 1; δ. 2; Z. ια. 1); mammiferous and lactiferous, or giving suck (B. δ. 1); all four mentioned together (Γ. ις. 1): vocal, pulmoniferous, and tracheiferous (Δ. δ. 4), has a breathing hole or tube (αὐλὸς), sleeps with it above the surface of the water, and snores (Δ. ι. 5); all the preceding comprehensively (Z. ια. 1, 2); differs from φώκαινα, the Porpoise (Z. ια. 1); breathes air (Θ. β. 3); has the mouth beneath (Θ. δ. 4); its gentleness and habits (I. λε).—(Arist. Hist. Schneid.)

sent the Hippuri of Pliny and Ovid, the ἵππουροι of Aristotle, Athenæus,\* and Oppian. These, Ovid says, were swift, pelagic fishes.† By Oppian they are not, as Cuvier asserts, “rangés parmi les Cétacés,” but enumerated with the Tunny, the Sword-fish (*Xiphias*), the Oreynus, &c. and others, which inhabit the unfathomable depths of the sea, far from the dry land (‘Αλιευτ. α. 179—184); and he relates that they follow closely, in shoals, floating bodies, especially timbers of wrecks; that they delight in the shade thus afforded; and that, advantage being taken of this propensity, they are caught easily and in great numbers (‘Αλ. δ. 404—438). Aristotle, that patriarch at once of the natural and dialectic sciences, says merely that the ἵππουρος spawns in spring, and that the fry are of extremely rapid growth (Hist. E. θ. 4); which Rondelet, in later times, writing of some species of Dorado, confirms, on the authority of the Spanish fishermen. In another place he mentions that it hides itself in winter (Hist. Θ. ιζ. 1), and is only caught at certain regular seasons, and those always the same.

I cannot think with Cuvier these traits to be “*peu distinctifs* :” and when to them is added the consideration of the etymological appropriateness, whether of the name ἵππουρος, *horse-tail*, so aptly referring to the form and elongation of the dorsal fin, or to the nature of its rays; or κορυφαίνα, in allusion to the resemblance to an ancient casque or helmet with its crest (κορυφή) of the head and fore-part of the dorsal fin; I am of opinion that no identity can be less justly doubted than that of some species of the modern genera, *Coryphæna*, or *Lampugus*, or *Pompilus*, with the ἵππουρος, or κορυφαίνα, or ἀρρευτήης, of the ancients. Inhabitants of the open sea or ocean in the warmer or tropical latitudes, they scarcely approach the shores except for spawning, towards the summer or the autumn; and in Madeira they are never taken but during these seasons. They possess amazing swiftness and unwearied activity; often following vessels, in their shade rather than in their track, hundreds of miles without rest or intermission; and from their voracity become an easy prey to sailors in such circumstances. In the month of June 1828, the

\* Cuvier reverses the fact in saying that the names *Coryphæna* and *Hippurus* are derived “le premier d’Aristote, et le second d’Athénée.” (Hist. ix. 275.) The first (κορυφαίνα), as far as I can find, does not occur at all in Aristotle. Athenæus mentions both: quotes Dorion and Epænetus, saying that the ἵππουρος is called the κορυφαίνα: Numenius, stating in his *Halieutics* that it is also called ἀρρευτήης, from its continual leaping; and Arcestratus, affirming those of Carystus (in Eubœa) to be the best. He also quotes from Aristotle the traits marked in the text above, but adds no new ones of his own. See Athen. (Dindorf) VII. 68. Vol. ii. p. 661.

† Cuvier (Hist. ix. 275), without noticing the latter character, has, by an evident misprint, “sapide” for the former “rapide.” Ovid’s words are

Nam gaudent pelago, quales Scombrigue Bovesque,  
Hippuri celeres, et nigro tergore Milvi.

Hal. 94, 95 (e textu Elzev. Burmann, and Maittaire).



vessel in which I was a passenger to England,—the *Jane*, commanded by the late enterprising and excellent though unfortunate James Weddell, author of a *Voyage in the South Polar Regions*, during which he discovered the Sea-Leopard Scal, or *Stenorrhyncus Weddellii*, F. Cuvier,—was accompanied from the back of Porto Santo, nearly into the mouth of the British Channel, by a shoal of Bonitos (some sort of Tunny) mixed with some large species of the genus *Coryphæna*, which the sailors called Dolphins. It was for a day or two the amusement of the crew to catch these fishes; for which nothing more was requisite than a hook baited with a piece of fat, or even with white paper. They generally darted with the greatest swiftness at the hook the moment it reached the water; and in a few minutes the decks were covered with their blood, and beaten by their dying struggles: till the zest of capture was blunted by its facility, and gave way to compassion. The flesh of the Dolphins was rather dry and insipid, with a subacid flavour, and soon palling on the taste; so that, after the first day or two, no one on board would touch them, and they followed us afterwards quite unmolested. After three or four days the Dolphins were observed no longer, but the Bonitos still attended us; till one morning, in the entrance of the Channel, we observed that our companions, as we now acknowledged them, had all deserted us. This was about ten days after their first appearance. I should add, that they kept generally on the shady side of the vessel, and not more in her wake than at her prow. I did not ascertain the species, being inattentive then to this branch of Zoology: but it struck me that the beauty of the change of colour in the *Coryphæna* had been much exaggerated; and it was certainly not universal. Most of them changed, however, almost at once under the eye, from a fine silvery blue to greenish yellow, varied with some spots and patches of the original blue. Some did not undergo this change at all; and others, in the water, appeared yellow naturally; but these might be of a different species. These fishes were about three feet long. In the stomach of one I found a fine *Hyalæa tridentata*, Lam. and a few *Crustaceæ*; but most of them were empty.

In Madeira I have since obtained three or four different sorts of *Coryphæna*: but the subject of the accompanying plate, which is the commonest of these, and abounds occasionally in the market during the summer and autumnal months, is not the common Dolphin or Dorado of sailors, the *C. hippurus*, L., of the Mediterranean; which is here comparatively rare.

The common Dorado of Madeira, *C. equisetis*, Cuvier,\* is a deeper and smaller fish, never exceeding, or indeed scarcely equalling, two feet in

\* I perfectly subscribe to Cuvier's correction, after Hardouin, of the probably mere transcriptional error, adopted by Artedi and Linnaeus from Gaza and the earlier editions of Pliny, of *Equisetis* for *Equisetis*.—See Cuv. and Val. ix. 294, note.

length; and, besides the smaller number of rays in the dorsal fin, is at once distinguished from *C. hippurus*, L., by its very small pectoral fins, by the absence of diffused pale dusky spots, and presence of minute black specks upon the flanks and sides. The fishermen believe it to be the female either of that or of another species, and distinguish it from others by its smaller size and less degree of yellowness. Although this last may be a characteristic in the fresh-caught fish, it certainly is one of an uncertain nature; and the former idea is quite false. I have repeatedly dissected male as well as female individuals, which differed in no point whatever of external characters.

The name *Dorado*, or *Dourado*, probably was given in allusion to the yellow wash with which the species of this genus are more or less gilded. *C. equisetis* makes its first appearance here in June; and is brought in abundance, from time to time, into the market throughout the four succeeding months: after October it entirely disappears. I have found the female full of well-formed eggs, in two large prismatic masses, of a bright orange-colour, in June and July; and the male with the milt enlarged and milky in October. The flesh is tolerably firm and juicy, but has a kind of mawkish taste; and, though considered the best of the *Dourados*, is but rarely brought to English tables. The best mode of preparation is to cut the fish across into pieces, and then fry them.

Shape, much compressed, oblong, narrowing chiefly by the ascent of the ventral line from the origin of the anal fin backwards; and forwards for a very short distance, from the commencement of the dorsal fin to the tip of the muzzle: the middle space, between the edge of the opercle and beginning of the anal fin, is an almost perfect oblong, with the dorsal and ventral lines nearly straight and parallel, giving a peculiar regularity of form to the fish, characteristic of the species. The line of the back is slightly convex from the origin to the end of the dorsal fin. The greatest depth of the body, halfway between the nape and the beginning of the anal fin, is from one fourth and a half to one fifth of the whole length; and the depth at the end of the dorsal and anal fins is about one fourth of this. The thickness from the eye to the anal fin is about one third of the depth.

Head small and short; its depth at the origin of the dorsal fin scarcely less than its length, which is one sixth of the whole length of the fish. The profile rises at an angle of forty-five degrees from the tip of the muzzle for about half the length from that point to the origin of the dorsal fin; and then ascends more gradually. This lower steeper half is blunt, and broad or rounded; forming a sort of obtuse or flattened triangle in front, the breadth of which at the base is half its height: the upper half is keeled. The nostrils are placed halfway between the eye and tip of the muzzle: the hinder nostril is an open, oval orifice; the anterior an inconspicuous, vertical, short slit, not easily discovered, placed close before the other, and only separated from it by a thin dissepiment. The eye is roundish-oval, placed remarkably low down, just above the hinder corner of the mouth, having a peculiar oblique or sinister expression. It is a little below the centre of the head vertically, and somewhat before it longitudinally. Its anterior canthus is produced into a sort of sinus; and its longitudinal diameter equals about one fifth of the length of the head.

Although the mouth when closed seems small, the gape is large, the commissure remarkably oblique, and with a crooked or distorted appearance. The maxillaries are narrow and slender, reaching to a point below the middle of the eye. The lower jaw is longer than the upper: both are furnished, in front, with a broad band of rather strong and sharp, but brush-like teeth, reaching to the corners in the lower jaw, and growing narrower backwards; but reduced almost to a single row on the sides of the upper jaw; which has also a round patch on the *vomer*, and a short and narrow band of similar teeth upon each *palatine*. The tongue is free, broad, rounded, with a large square patch of brush-like teeth in the middle, and the edges or border in front and on the sides remarkably thin and smooth.

The preopercle is peculiarly plain and flat, of a narrow parabolic shape, directed obliquely downwards. The opercle forms with the interopercle, which is rather broad, a wider parabolic curve outside the former: it has a slight notch or sinus near the top. A few diverging striæ radiate from the articulation of the opercle with the frontal bone, partly over its upper end. Otherwise the whole three are smooth, unarmèd, and even; with entire edges.

The branchial opening is large, its membrane prominent, with the edge broadly scalloped. Its six upper rays are flat, and very strong and broad: the first or lowest weak, and difficult to find; being not flattened like the rest, and concealed beneath the second.

The whole head, muzzle, lower jaw and opercles, with the exception of a scaly patch upon the cheeks beneath and behind the eye, are perfectly naked, and covered with a smooth and even skin. The whole has a remarkably plain compact appearance, such as indeed is usual in the swift pelagic fishes. There is no peculiarity observable externally about the supercapulary and humeral bones, on the shoulders, or at the axils of the pectoral fins.

The lateral line forms generally an abrupt festoon above the middle of the pectoral fins; beyond which, after a little irregular waving, it continues straight, and in the middle of the body, to the end.

The scales, beginning on the nape at the origin of the dorsal fin, are extremely small and inconspicuous, oblong or trapeziform, somewhat cuneate or broader at the outer or hinder end, finely striate concentrically like the lines at the ends of the fingers, but otherwise smooth and almost membranous. They extend far up between the rays of the caudal fin; but all the other fins are smooth and naked.

The dorsal fin begins very forward on the nape; a vertical line from the base of its first ray falling, however, perfectly clear of the hinder edge of the orbit. It is highest in front, in a line with the edge of the opercle, or base of the pectoral fins; and from a little behind this point it gradually lowers off, rising again a little towards the end. The first rays are very short and crowded, and so buried in the thick leathery elastic skin or web that they are difficult to count; but they gradually increase in length to the eighth ray, to which the following ten or twelve are nearly equal. The anterior rays are simple; the hinder become gradually more branched, as well as more remote, and their tips protrude beyond the web: but all are of the same flexible elastic substance, like whalebone; differing equally from the spines, as from the branched articulated rays of most fishes. Its greatest height in front scarcely equals half the depth of the body below it, and is one sixth or seventh part of the length of its own base; at the hinder end it is scarcely half this height in front.

The anal fin begins opposite the thirty-fourth ray of the dorsal, which it resembles in shape; in structure corresponding with its hinder half. The elevated part in front, however, is not so much rounded off, but more abrupt or angular, and scarcely equals the height of the hinder end of the dorsal fin. The first ray



is very short, the third or fourth the longest; the fifth or sixth abruptly shorter. The tips of all its rays, except the two or three first simple rays, are also still more free and branched than any in the dorsal fin. It is lowest at about two thirds of its length, opposite the corresponding lowest part of the dorsal fin.

The last ray of both the dorsal and the anal fins is connected to the body partly by a web. It is very rarely double.

The pectoral fins are remarkably small, short, and ovato-falcate; their length is only about one tenth of the whole length. They are placed nearly halfway up the sides, and have a peculiarly neat compact appearance, from the closeness and flatness of their rays; which seem as if they had been planed on each side.

The ventral fins are very large, broad, ovate, with the edges irregularly jagged, and the three or four hinder rays much branched and strong. They are considerably longer as well as larger than the pectoral fins, reaching halfway to the origin of the anal fin, and being one eighth of the whole length of the fish. Their first ray is weak and flexible though simple, and nearly as long as the first branched ray: the second of this last sort is the longest; the last is webbed to the body. Each of the branched rays is also curiously webbed to the preceding at the base, by a short lateral membrane, as in the Tunny.

The caudal fin is deeply forked: its forks are equal, narrow, long, acuminate, and furnished at their outer base with several short accessory rays. The longest outer ray of each fork is also simple.

Colour light silvery-lead, darker and steely on the back; dead white, washed more or less with citron-yellow on the flanks, beneath the lateral line, and on the belly; immaculate, but the sides here and there, chiefly beneath the lateral line, sprinkled with minute, angular, distinct, remote, jet-black specks, like grains of sand, of different sizes. The dorsal fin is very dark, approaching to black, without spots or patches, but with rich blue iridescent tints, and a sort of pruinose bloom; the whole most curiously marked with darker, rivulose, anastomosing, forked and wavy veins or lines, running across the rays obliquely backwards. The anal fin is white at the base, blackish towards the edge, fimbriated with white; and the produced tips of the rays in both the dorsal and the anal fins are white or colourless. The pectoral fins are pale bluish-slate, with the tips and first ray blackish. Ventral fins blackish inside or above, especially towards the tips; white outside or beneath. Caudal fin pale bluish-silver; brownish or olive towards the tips of the forks. The mouth inside and tongue are white; except the plates of teeth, which are brownish flesh-colour. Iris silvery-glaucous or pearly apple-green.

The yellow wash upon the under-parts of the body and base of the anal fin is very evanescent, and removes by slight rubbing, coming off upon the fingers.

In a single female individual, taken full of spawn, and brought to me in fine condition at the end of June, was observed a row of seven or eight faint dusky spots, about the size of peas, extending forwards from the end of the dorsal fin along the ridge of the back. The flanks and sides were specked as usual, but otherwise immaculate. The base of the dorsal fin itself was of a bright blue colour, with a faint dusky mark or spot behind each ray: the blue reached up about one third of the fin's height; the remaining two thirds being inky-black. The sides and belly in this fish were less washed with yellow than usual.

In the dissection of another individual, a male, in the month of October, the stomach was found to be very large and long; extending to the vent, and distended with food: it contained a Chicharro (*Caranx Cuvieri*, nob.) seven and a half inches long, or one third the length of its devourer; and many horny orbits and crystalline lenses of other fishes. The *caca* were capillary, very fine and numerous, uniting the lower end of the liver into one uniform bunch or mass with

the stomach all round; the whole resembling a mass of cellular tissue filled with small Flukes (*Fasciolæ*) or other parasitic worms. The liver was rather small. The spleen, external to the mass of viscera, and placed below the *cæca*, was small, and, as usual, dark atro-purpureous. The milt was soft, large, elongated, and milky-white. The intestine is extremely fragile, large but short, and wholly adnate to the gland-like mass of *cæca*; making two bends or one complete volution in its course. There is no air-bladder. In a female individual, examined in July, no difference was found, except in the presence of eggs or roe in place of milt.

The vertebræ are very short, and thirty-three in number; which is two more than in two other Madeiran species (*C. hippurus*, L. and *C. Nortoniana*, nob.), the excess being in the caudal vertebræ. They are united to each other on the upper side by little longitudinal crests, which incline forwards. The abdominal vertebræ vary from thirteen to fourteen; and are all, except the first, furnished beneath with short irregular, unequal, descending *apophyses*, not uniting into rings or arches. The lower prolonged spiny *apophyses* of the caudal vertebræ are given off from the points of apophysal arches, the branches of which originate just before (as those of the upper side the vertebral column do just behind) the constricted middle point of each vertebra. The first of these *apophyses* is ensiform, and elevated on a kind of stalk.

The vertebræ and bones in this and other *Coryphænæ* are brown and flesh-coloured, and of a somewhat coarse or carious texture; very different from those of the generality of fishes, and more like those of young quadrupeds.

This is entirely a surface fish at the time of its appearance on these shores. Fishing off Magdalena, a village five leagues to the west of Funchal, about a league and half from shore, I have several times on calm days in August and September, fallen in with shoals of them, generally accompanying floating planks or timber covered with Barnacles (*Pentelasmis lavis*, Leach); in the neighbourhood of which were also often many individuals of *Pompilus Bennettii*, nob., and of *Naucrates ductor*, Risso; whilst on the plank itself was sometimes resting a fine Turtle (*La Caouane*, Cuv., *Testudo Caretta*, Gm.), haunted with its usual parasite, *Grapsus testudinum*, Roux. The Douradas bite eagerly at a hook baited with a piece of Mackerel, splashed and played about the surface of the water with a rod: and ten or fifteen are in half as many minutes generally captured; upon which the rest make off. They are remarkably bold, strong, and vigorous, crowding and rushing after the bait, and leaping sometimes quite out of the water; and when first pulled into the boat, they skip about incessantly from one end of it to the other in the most astonishingly active manner for a few minutes; and then, with a sudden gush of blood from the gills and mouth, die all at once. In the water, or whilst yet alive, some of them are of the most pure dazzling white, like burnished silver, with merely a light watery azure tinge along the back: much resembling *Lichia glaycos* upon its first capture, but still whiter; and in such, no specks or yellow wash appear. After death, the blue of the back becomes darker, and spreads somewhat lower down: and in some of these examples there came out presently a row of



dusky iridescent greenish spots, the size of peas, on the ridge of the back, on each side, at the base of the dorsal fin, proceeding some way forwards from its end; but still no yellow wash: and the black specks upon the sides were so few and rare, if not sometimes entirely wanting, that they might easily be overlooked. Others appeared quite yellow in the water, which the fishermen attributed to their eagerness to seize the bait: and many were more or less washed with yellow at their capture on the sides and flanks, which proved, however, very evanescent, disappearing almost wholly after death. Some few had, besides the scattered black specks, a few bright evanescent azure spots, or *guttæ*, about the cheeks and breast, and the dorsal fin paler or more azure than usual. These various examples were, for the most part, twenty or twenty-one inches long, proving on dissection both male and female fishes; some of the latter being in roe.

I cannot feel entirely assured of the identity of this Madeiran *Coryphæna* with the *C. equisetis* of MM. Cuvier and Valenciennes; which, besides being a somewhat larger fish (twenty-five to thirty inches long), is said to have the head higher than long, the dorsal fin high in front (the height of its anterior rays being half-way between one fourth and one fifth of the length of its own base), and lowest at, instead of before, its last ray, with the profile rising vertically at its origin for about one third of its length; though in their figure it is represented rising at an angle of little more than 45°. I am also much inclined to believe that their *C. Lessonii* (Hist. IX. 307), briefly indicated from a drawing made by M. Lesson, owes its origin to an observation of a fresh captured individual, such as those described first in the preceding paragraph, of the Madeiran fish: for which, should it eventually prove distinct from both these Cuvierian species, I would propose the name of *Cor. arenulata*.

The uniformity of size in this fish is remarkable. I have never yet seen one below sixteen or above twenty-four inches in length, and only one or two which had attained the latter size. The individual figured in the accompanying plate measured twenty-one inches and three quarters, which is about the average size, and had fifty-three rays in the dorsal fin. In fifteen examples, including this,

3 had 53

4 — 54

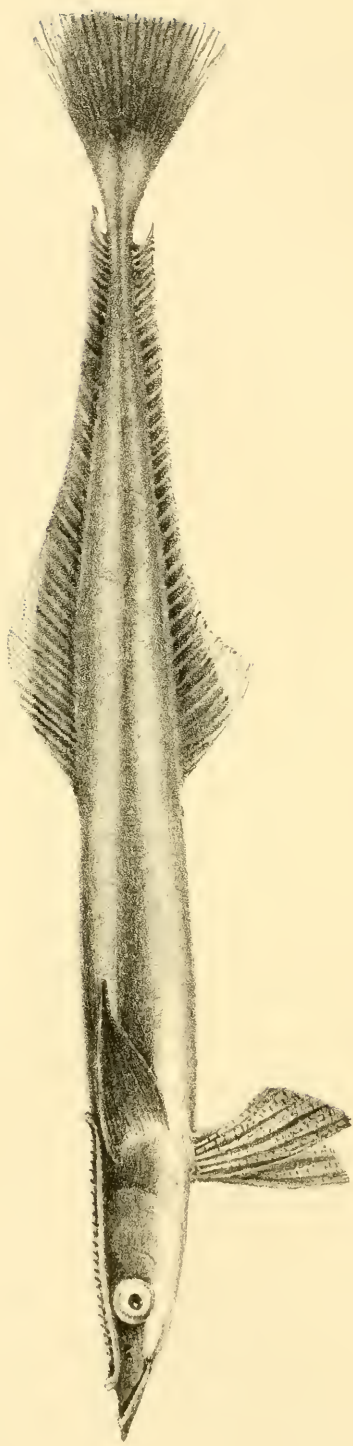
4 — 55

3 — 56

and 1 — 58 rays in the dorsal fin.







*T. II. M. Y. del & Sc.*

TAB. XI.

ECHENEIS VITTATA, NOB.

*Pogador i. e. Pegador, ou Peixe Piolho.*

STRIPED REMORA.

CHAR. FAM. AC GEN.

Corpus elongatum, nudiusculum s. minutissime squammulosum. Caput supra disco transverse laminifero. Maxillæ, vomer, et palatini, scobinati.

*Obs.*—Pisces mensuræ mediocris, vix edules, pelagici, parasitici, capitis clypeo corporibus alienis affixi, vagabundi, subtropici, subunicolores, nigrescentes. Caput depressum: os magnum plagioplateum, rictu horizontali, maxilla inferiore longiore. Pinna dorsalis unica, subpostica, anali opposita; utraque antice alta: ventrales subpectorales. Cæca haud permulta. Vesica aëris nulla. Membrana branchiostega 8—9-radiata.

Genus adhuc unicum; ideoque character idem ac familiæ. Sectiones generis duæ: cauda nempe 1) truncata; 2) lunata. Species plurimæ latentes, vix adhuc notæ.

CHAR. SPEC.

E. vinoso-nigrescens, pallido variegata et bivittata, fascia intermedia laterali nigra: pinnæ dorsalis analisque caudalisque apicibus extremis albis; pectoralibus nigris, ovatis, acutiusculis, integris: corpore postice attenuato, gracillimo: oculis majusculis: lingua scabra: clypei laminiis xxiii.; cauda truncata.

D. 39; A. 39; P. 22; V. 1 + 5; C.  $\frac{1 + VIII.}{1 + VII.}$

*E. vittata*, Suppl. Mad. Fish. in Proceed. Zool. Soc. 1839. p. 89.

*Longit.* pedalis = 14 — 15 × alt.

*Tempus*, æstate s. Augusto.

*Locus*, in pelago, Squali assecla: rariss.

THE identity of any species of the modern genus *Echeneis*, with the famous Ἐχένηϊς, or Remora, of the ancients, has been far too hastily assumed. The later Greek and Latin naturalists have, indeed, preserved accounts, which they relate were current in their days, of certain marvellous effects produced in stopping or retarding vessels, by the adhesion to them of a fish, which, in allusion to these popular stories, they have called Ἐχένηϊς, or Remora, the Ship-stayer. Two different fishes are, however, plainly mixed up in these histories. Aristotle's, which is, he says, a small rock-fish, not used for food, but philtres, and with feet-like fins,\* seems to

\* Arist. Hist. B. i. 3.



have been some sort of Goby or Blenny.\* Of its adhering or retarding powers he says nothing farther than may be supposed to be conveyed by the name itself. Oppian's Ἐχενήϊς ('*Al.* A. 212—243), as Rondelet has long ago observed, is evidently the common Lamprey (*Petromyzon marinus*, L.); and this remark of course applies to the Ἐχενήϊς of Oppian's copyist Ælian (*Hist.* i. 36, and ii. 17). Pliny's Remora, "like a great slug" (*limax*), which stopped the ship of Caius Cæsar (*Caligula*), or that which he mentions, after Trebius Niger, of a foot and a half long and five fingers thick, might well be the same; but in another place (*lib.* ix. cap. 25), his account of it is a transcript of Aristotle's above cited, with his own additions of its powers; and this last remark again applies to Ovid's:

"Parva Echeneïs . . . mora puppibus ingens."

*Halieut.* 99.

The account of the Ἐχενήϊς, also given by Suidas the Greek lexicographer, that it is a little fish, not used for food, the size of a Goby, with four fins, agrees with Aristotle's fish. Another very different sort of Remora is that which Pliny speaks of, after Mutian, as illustrious, and consecrated to the Gnidian Venus, for stopping the messengers despatched by Periander, the Corinthian tyrant, on a barbarous embassy. This was by Mutian's description a shell, belonging, probably, to the modern genus *Cypræa*.

Failing, however, to discover any traits of the modern Echeneïs or Remora of ichthyologists in the fishes so called by the ancient Greek and Latin writers, a more probable identity may be suggested between some species of the genus, and the fish by Aristotle, and his copyist Ælian, called *φθεῖρα*, the Louse. After speaking of the true crustaceous parasitic animals infesting fishes, he proceeds, "and in the sea between Cyrene and Egypt, there is a fish (*ἰχθὺς*) about the Dolphin (*Delphinus delphis*, L.) which they call the Louse; this becomes the fattest of all fishes, because it partakes of the plentiful supply of food captured by the Dolphin." (*Aristotle's Hist. E.* *xx.* 3. See also Ælian, ix. 7.) The different species of the modern genus *Echeneïs* are occasionally called by the Portuguese Piolho, or Peixe piolho; meaning the same thing. And Schneider, whose opinion upon this subject I find, on turning to the passage in Ælian, agreeing with my own, relates, after Forskål, that in Arabic the *Echeneïs naucrates*, L. is called the Shark's Louse.†

In the stories which some of these writers have related of the powers of the ancient Remora in stopping vessels under the impulse of full sails or oars, there is much doubtless of mere fiction or exaggerated fancy;

\* I should have said of *Oleironectes*, Cuv.; but, hitherto, modern naturalists have discovered no species of this genus in the Mediterranean.

† "*Keûl* or *kaml el kersh*, Arab. . . . It is mentioned by Forskål as seen at Gidda, and by Hasselquist at Alexandria."—Harris, *Dict. Nat. Hist. Bibl. voce Fish.*

yet, on the other hand, it would be rash altogether to deny their truth. Like most such popular accounts or vulgar errors, they may probably be founded on some real circumstance, or natural occurrence, distorted by exaggeration into the wonderful. There would be nothing marvellous, that a Lamprey, of even ordinary size, fixed to the keel or rudder of a boat, suspended by one end and struggling in the water, should, as related by Rondelet upon his own experience,\* greatly retard such vessel's progress, render its course unsteady, and baffle the exertions of its rowers.

Again, it is remarkable that the Dalmatians at this day, as Schneider in his note on *Ælian*, ii. 17, mentions upon the authority of the Abbé Fortis, possess the same idea regarding a fish they call *Packlara*, which the ancients held regarding their *Echeneis* or *Remora*. So strange a notion is not likely to have originated from communication with others amongst a wild and illiterate population; or, again, to have sprung up spontaneously and independently without some real ground. Without recourse, therefore, to the marvellous or extraordinary on one hand, or to mere fiction on the other, it does not seem unreasonable to suppose, that the accidental attachment to the rudder of a small-sized vessel of some fish like Rondelet's Lamprey may have originated an impression, which has subsequently been generalized, and transferred to other sucking-fishes, in themselves incapable of producing like effects.†

The modern genus *Echeneis* seems to have obtained little attention from the later ichthyologists, who have not added more than three or four species to the two enumerated by Linnæus. Rare, and occurring only accidentally, or at remote intervals of time and place, it has been difficult to in-

\* "His omnibus quæ nulli alii melius quam lampetræ nostræ competere possunt, accedit experientia ipsa, cujus primum me admonuit Gulielmus Pelicerius episcopus Mompeliensis singulari eruditione præditus, ex qua experientia constat lampetram navibus iis præsertim quæ recens pice illitæ sunt ore adhærere, pice, ut aiunt, exugendæ gratia. Quod si triremis clavo os affixerit, ejus impetum retardari certum est. Id nobis evenit Romam proficiscentibus cum clarissimo Cardinali Turnonio. Vidimus enim optimæ triremis, cujus citissimo cursu vehebamur, impetum inhibitu, cujus incertam causam cum vectores perquirent, tandem compertum fuit lampetræ ore clavo affixæ vi id effici; quæ capta, et convivio apposita, moræ allatæ pœnas dependit. Cujus rei locupletissimos testes habeo nobiles et graves viros, qui eadem navi vehebantur."—Rond. de Pisc. 402.

† Rondelet seems to have taken a similar view of the matter. After transcribing from Aristotle a dissertation on the reason of the use and power of the rudder, he proceeds: "Quare si recta et celerrime currat navis, et echeneis, ore clavo vel puppi affixo, caudam vel se totam, modo in dextrum, modo in sinistrum moveat, necesse est etiam in prora motionem hanc percipi, et ad echeneidis motum ambiguum, ambigue quoque moveri, ac proinde impetum ejus inhiberi, cum ab Aristotele demonstratum sit, et experientia comprobatur, ad exiguam unius extremi motionem, extremum alterum, atque adeo totam molem continuam nutare. Lampetra igitur verbi gratia, vel quavis alia remora, non in ipsa nave neque ipsius lateribus sed puppi vel gubernaculo adhærente, et caudam vel reliquum corpus motitante fluctuat navis, nec progreditur, nec ultra fertur, non aliter quam si tranquillo mari in prospero et celeri navis cursu gubernator imperitiorum ad gubernandum admittat, qui clavum recte tenere non possit: firmissime enim in cursu tenendus est, ne fluctuet navis, alioqui mox retardabitur impetus."—Rond. de Pisc. 439, 440.

stitute those close comparisons of individuals, which are essential to the clear establishment of species. These fishes bear, indeed, to one another a strong general resemblance; yet I believe that the species will prove numerous, and that the two originally mentioned by Linnæus, which have too long appeared to serve for general receptacles, constitute, in fact, the types of two divisions of a genus rich in species. Of seven or eight individuals examined in Madeira, three only could be considered specifically the same.

A single example only of the fish here figured and described has yet occurred; but it is a species possessing such decided characters, that no scruple can be felt in giving it as new.

Shape generally thin and elongated, yet round and thick forwards at the shoulders; very slender and much attenuated towards the tail. Head, as far back as the shoulders, broad, depressed; thence the body is nearly round and taper to the root of the caudal fin, where it is subcompressed. The belly is not channelled, but simply rounded. The dorsal and the ventral lines are parallel from the origin of the pectoral or ventral to that of the dorsal or anal fins; behind this point they gradually converge, again diverging slightly at the root of the tail. Thus the depth, from the base of the pectoral to the origin of the dorsal fin, is nearly equal, and between one fourteenth and one fifteenth of the whole length; but at the hinder end of the dorsal or anal fins, it is only between one third and one fourth as much as at their commencement. The greatest breadth or thickness at the base of the pectoral fins greatly exceeds the depth; being about one ninth of the whole length: but at the origin of the dorsal or anal fins, it is one eighth less than the depth at the same point; and at their termination, it is equal to the same.

The head, seen in profile, tapers forwards from the throat to a sharp thin point; viewed from above, it is broad and flattened, furnished with an oval sucking-disk, containing twenty-three\* transverse laminae, serrated as usual, and extending backwards to about the middle of the pectoral fins. The length of this disk is twice and a half its breadth, and is contained four times and a half in the whole length of the fish. It reaches forward for about a quarter of its length before the eye, nearly to the tip of the upper jaw, which is greatly shorter than the lower, exposing both its broad bands of maxillary brush-like teeth. Palatines and vomer with similar bands of teeth. Tongue scabrous, very thin. Nostrils two minute, oval, simple orifices, close together in a line from the eye to the tip of the upper jaw; the hinder largest. Eye rather large comparatively with some other species; it is between one seventh and one eighth of the length of the sucker. The outlines of the opercle and preopercle are completely concealed by the skin; so that, at least whilst recent, or without dissection, the comparative length of the head cannot be ascertained. The cheeks and sides of the head are quite plain, compact, and even. Being unwilling to injure the specimen, I did not count the branchial rays.

The skin all over appears to the eye finely scabrous or shagreened, but is smooth to the touch. It is not particularly slimy; but the smell of the fish is very disagreeable, like *mucus*.

The lateral line begins high up the shoulder, and is flexuose or wavy at its origin, but straight beyond the pectoral fins, running along the middle of each side, just within the upper edge of the dark-coloured band, and continuing up the cau-

\* Not twenty-four, as by a slip of the pen in Suppl. Mad. Fishes.

dal fin between the eighth and ninth rays. It is formed by a series of small dots.

The pectoral fins are rather large, and situated on the middle of the sides a little before the end of the sucking-disk. They are ovate, pointed or subacute, and quite entire; their length equals the breadth of the body at their base.

The ventral fins are placed exactly underneath the pectoral; they are as large and long as these, but more obtuse or fan-shaped. Their first simple ray is two thirds the length of the first and longest branched ray. The last is connected half-way up by a web to the body. These fins fit in under a slight ridge on the side of the belly.

The dorsal and anal fins correspond exactly in position, and in general shape and structure. They begin at the middle of the body, not reckoning the caudal fin; are high and raised in front, and then gradually narrow off backwards, ending a little short of the commencement of the caudal fin, and having their last ray partly webbed to the body. The anal fin is more distinctly pointed in front, and narrower behind than the dorsal.

Caudal fin large, fan-shaped, convexo-truncate, with the edge slightly uneven.

The rays of all the fins are obscure, and concealed by a thickish leathery membrane. They can scarcely be counted accurately whilst the specimen is fresh.

Colour generally blackish, with a warm purplish tint, mottled or varied with paler or whitish, and with two light bands along the sides, inclosing a dark conspicuous central one, which runs immediately below the lateral line, spreading out upon the caudal fin so as to leave only the two outer tips and edges pure white. The two pale bands become towards the shoulders clearer, more decided white; and the lower is produced forwards, beneath the eye, to the corners of the mouth. The throat is mottled black and white; the belly dark and mottled; the back uniform black. The sucker is also black; especially its smooth, raised, fleshy border. The pectoral fins are uniform black; the ventral paler, but black towards their tips; the dorsal and anal black, but with their front raised-part bordered, and the tips of all the rays just touched with pure white. Caudal fin black, bordered at the upper and lower tips and edges with pure white. The iris is coppery. The mouth inside pale whitish.

The length of the example figured, the only one which has occurred, and which was captured in the month of August, is twelve inches and three quarters.

I cannot find this fish anywhere distinctly specified; though it may perhaps have sometimes passed for *E. naucrates*, L.\* It is at once distinguished from *E. lineata*, Menzies, in Linn. Trans. i. 187, t. 17, f. 1, in the greater number of laminae with which the sucking-disk is furnished, &c.; and from *E. lunata*, Bancroft, in Zool. Journ. v. 413, t. 18, in the entire caudal fin. The number of rays in the dorsal and anal fins is also considerably greater than in these, or in other Madeiran species.

\* See Dr. Bancroft's remark, in the Zool. Journ. v. 413, on the *E. naucrates*, "pinnis posterioribus albo marginatis," of Dr. Patrick Browne; to whose work I regret I have not access.









*T. 12. M. Y. del & So.*

## TAB. XII.

## ZYGÆNA MALLEUS, VAL.

*Cornuda.*

THE COMMON HAMMER-FISH, OR HAMMER-SHARK.

## CHAR. GEN.

Caput transverse dilatatum ; oculis ad latera extrema utrinque. Dentes in utraque maxilla conformes, laniiarii, triangulares, serrulati, recurvi. Pinnæ dorsales duæ, remotæ : secunda anali fere opposita. Spiracula nulla. Fissuræ branchiales quinque ; posterioribus supra basin pinnarum pectoralium. Oculi membrana nictitante distincta.

*Obs.*—Squali majores, ferociores, regionum calidiorum incolæ, subtropici ; aspectu capitis deformi, monstroso.

## CHAR. SPEC.

*Z.* capite malleiformi, triplo quadruplove latiore quam longo, antice subsinuato, convexiusculo : naribus oculis contiguis.

*Z. malleus* " Val. Mem. Mus. ix, 222." Cuv. R. An. ii. 393.—Risso, iii. 125.—Yarr. Brit. Fish. ii. 406 (vignette), and Suppl. ii. 61.

*Sphyrna Zygæna* (Raf.), Mull. und Henl. Plag. p. 51.

*Squalus Zygæna*, Linn. i. 399.

*Squalus* capite latissimo transverso mallei instar, Art. Syn. 96, Gen. 67.

*Zygæna*, Rondel. 389.—Salv. 129, t. 40.—Will. 55, t. B 1 (copied from Salviani).

*Longit.* = 2 — 10 v. 12 pedes.

*Tempus*, æstate, autumnio, hieme ; sed per totum fere annum.

*Locus*, in profundioribus, a littore longule : vulg.

THE hideous aspect of this Shark well justifies the character and place assigned it by Schiller, when, in his exquisite ballad of "the Diver," he is peopling his Charybdis with the "monsters of the hoary deep."

Schwarz wimmelten da, in graufem Gemisch,  
Zu scheußlichen Klumpen geballt,  
Der flachliche Rode, der Klippenfisch,  
Des Hammers gräuliche Ungefaßt,  
Und bräuernd wies mir die grimmigen Zähne  
Der entsetzliche Hay, des Meeres Hyäne.

Der Tauchers, Stanz. 20.

Dark welter'd there, in hideous coil  
Of loathsome ball entwined,  
The prickly Ray, the slimy Lump,  
The grisly Hammer's monster kind ;  
And, threatenful champing, fiercely grin'd at me  
The horrid Shark, Hyæna of the sea.

Indeed, the wildest fancy of the poet, or the pencil of a Fuseli, could scarcely conjure up a monster more disgusting, frightful, and repulsive than a Hammer-fish of any considerable size. The strange position of the large and goggle eyes adds much to the deformed appearance of the head; and its strength is, by the fishermen, reported to be quite in correspondence with its frightfulness of aspect and its large and formidable teeth; so that alive, and in its native element, it were not easy to conceive a more terrific monster. Fortunately it does not appear to quit its native depths or to approach very near the shore; for, although by no means uncommon either in Madeira or elsewhere, I find no records of its fatally attacking man.

Aristotle mentions the *ζύγαινα* only once; and then so briefly and in such company, that it is very doubtful whether he intends the fish so called by the more recent writers. Speaking of fishes which have the gall-bladder (*χολή*) adnate to the liver, he cites as examples certain Sharks and Rays, "and of the long fishes, the Eel, the Pipe-fish (*Syngnathus*, L.), and *Zygaena*" (*καὶ τῶν μακρῶν ἔγχελυς καὶ βελόνη καὶ ζύγαινα*).<sup>\*</sup> Had he meant our Hammer-fish, it would have been included rather in the former member of the sentence.

This fish appears to be, however, the *ζύγαινα* of Oppian (Hal. A. 367, and E. 37), and of his copyist Ælian. The former terms it *βλοσυρή* and *ῥιγεδανή*: and enumerates it amongst other fierce, strong, and large sea-monsters, inhabiting the deep and rarely approaching the shores. Ælian, in a passage (lib. ix. cap. 49) borrowed from this of Oppian's, calls it *μέγιστα*. The etymology of the name (from *ζυγός* a yoke or balance, or sometimes a plumb-rule, whence, in Latin, this fish has been called *Libella*, and by Willughby the Balance-fish) has been thought to favour this identity, alluding to the form or transverse setting-on of the head.

The later ichthyologists and voyagers have long been well acquainted with this fish or others of the genus. In the Mediterranean, as in Madeira, it appears not to be uncommon. Salviani and Rondelet relate that it is called at Rome *Ciambetta*; in other parts of Italy, *Pesce Martello* and *Balista*; at Marseilles, *Peis Jouziou*, or the Jew-fish, from the resemblance of its head to a head-dress worn formerly by the Jews of Provence; and by the Spanish, *Peis Limo*, *Limada*, and *Toilandolo*. At Nice, Risso affirms that it is called *Marteou*. In Britain it appears to be a mere straggler, of very rare occurrence; a single individual only having recently been captured on the Norfolk coast. All are agreed in speaking of its flesh as hard, and disagreeable in smell and flavour, so that it is only eaten by the lowest poor.

In Madeira it is in summer one of the more common Sharks; but is not eaten, except when now and then imposed upon an ignorant or unwary customer. Oil is extracted, however, from the liver. The fishermen

<sup>\*</sup> Arist. Hist. B. iæ. 7.

describe it as extremely fierce and strong, often breaking their hooks or lines. It is taken about a league off shore, in from sixty to one hundred fathoms water.

There are four or five more species of this genus known to ichthyologists, which are all characterised by the form and width of their heads compared with their length. Mr. Yarrell, in his Supplement to the British Fishes, (Part II. p. 65,) has furnished the naturalist with a valuable series of sketches illustrating these forms. One of the most singular of these is a new species (*Z. laticeps*, Cant.) recently discovered in the Eastern seas by Dr. Cantor. In this, the head in width equals one half the length of the whole fish, and appears to be five or six times as broad as long. In *Z. tudes*, Val. (le Squalo Pantouffier, Lacep.), which comes the nearest to *Z. malleus*, the head is more convex in front, and comparatively much less produced side-ways in proportion to its length; measuring, in a straight line from eye to eye, only twice instead of three or four times its length (capite sc. duplo latiore quam longo). Having been occasionally taken in the Mediterranean,\* this South American as well as Eastern species may perhaps be met with also in Madeira by some future naturalist; in which case it may be recognised by attention to this point.† Of the remaining species, *Z. Tiburo*, Val. (*Squalus Tiburo*, L. Will. t. B 9, f. 3), and *Z. Blochii*, Val. Bloch. t. 117, have the nostrils remote from the eyes, and the head vastly more convex in front; whilst in the former Brazilian species, it is also still less produced transversely, in proportion to its length, than in *Z. tudes*, Val.; and, in the latter, the side lobes are remarkably recurved. *Z. Mokarran*, Rupp. on the other hand, is said to have the fore-margin of the head nearly straight or rectilinear, and not convex before the eyes.

The following description is derived principally from two small female individuals of *Z. malleus*, which measured about two feet in length.

Shape of the body slender, elongate, more ventricose than usual in most Sharks just behind the pectoral or behind the first dorsal fins, and attenuated forwards into a sort of neck, as well as backwards towards the root of the caudal fin; this character, however, has been exaggerated in the greater number of the published figures.

Head transversely oblong, much depressed and flattened, set on the body rather like the head of a pick-axe on its handle, than of a hammer, which is at right angles with it; the two side lobes turning slightly backwards, and the front edge, which is thin, being convex, like the segment of a circle, and faintly waved or festooned: its middle lobe is broadest and most prominent, very obtuse or even slightly retuse in the middle; and on each side can just be traced a smaller lobe, between it and the nostrils, which are seated in a shallow sinus close before or rather within the extreme and somewhat prominent angles of the front margin. Just beyond these angles, on the outer margin, are the large and prominent pro-

\* Risso Hist. iii. 126.

† It should, however, be observed, that MM. Müller and Henle throw doubts on its distinctness as a species from *Z. malleus*.



truded eyes; which often look as if they had been partly forced out of their sockets. The hinder margin of the side lobes of the head are quite thin and membranous. Along the front margin, from the nostrils for some distance inwards, runs a curious deep narrow groove or channel. The whole surface of the head, above and beneath, is sprinkled with mucous pores, emitting, when pressed, a clear transparent jelly, and arranged in regular groups or figures.

The mouth is placed quite underneath, just at the junction of the head and body: it is considerably arched, but rather narrower than usual; so that the gape is small. It is, however, formidably armed, even in individuals of two feet long, with three rows in each jaw of large triangular sharp teeth\* bent backwards towards the corners of the mouth: those of the upper jaw are larger than in the lower. The tongue is large, broad, fleshy, and resembling the human; it is white, like the whole inside of the mouth, and slightly rough towards the middle.

The branchial openings are five in number, short, and altogether placed above the level of the fore-axil of the pectoral fins: the last falling also behind a vertical line through the same. There is no trace of spiracles.

The pectoral fins are rather small, short, and triangular; they are placed at about one third the distance from the tip of the muzzle to the base of the caudal fin.

The first dorsal fin is placed a little before the middle of the same distance, beginning just behind the base of the pectoral fins. It is remarkably large, both high and broad, triangular; its tip obtuse, its hinder end short but pointed.

The second dorsal fin is far behind, nearly at the root of the tail. It is rather small, subquadrangular, with the hind end produced into a lengthened acuminate point.

The ventral fins are opposite the halfway point between the first and second dorsal fins. They are trapeziform, and of moderate size.

The anal fin corresponds in shape and position with the second dorsal; it is only a little larger.

Tail very large and powerful, with a deep forked or  $\triangleright$ -like cut or impression above at its junction with the dorsal line of the body, and a faint dimple below at the root of its lower lobe. The upper fork is nearly half the length of the head and body together, and has the hinder margin near its tip abruptly produced into a lobe. The lower fork is short, only one third the length of the upper, simple, acute. Both forks spring from the body at an angle little less than forty-five degrees, as usual in the true Sharks, instead of falling, as erroneously represented in the figures, into the same line with it.

The skin of this Shark, though rough, is of a much finer grain than usual, and has a peculiar glossiness or silkiness of lustre quite characteristic.

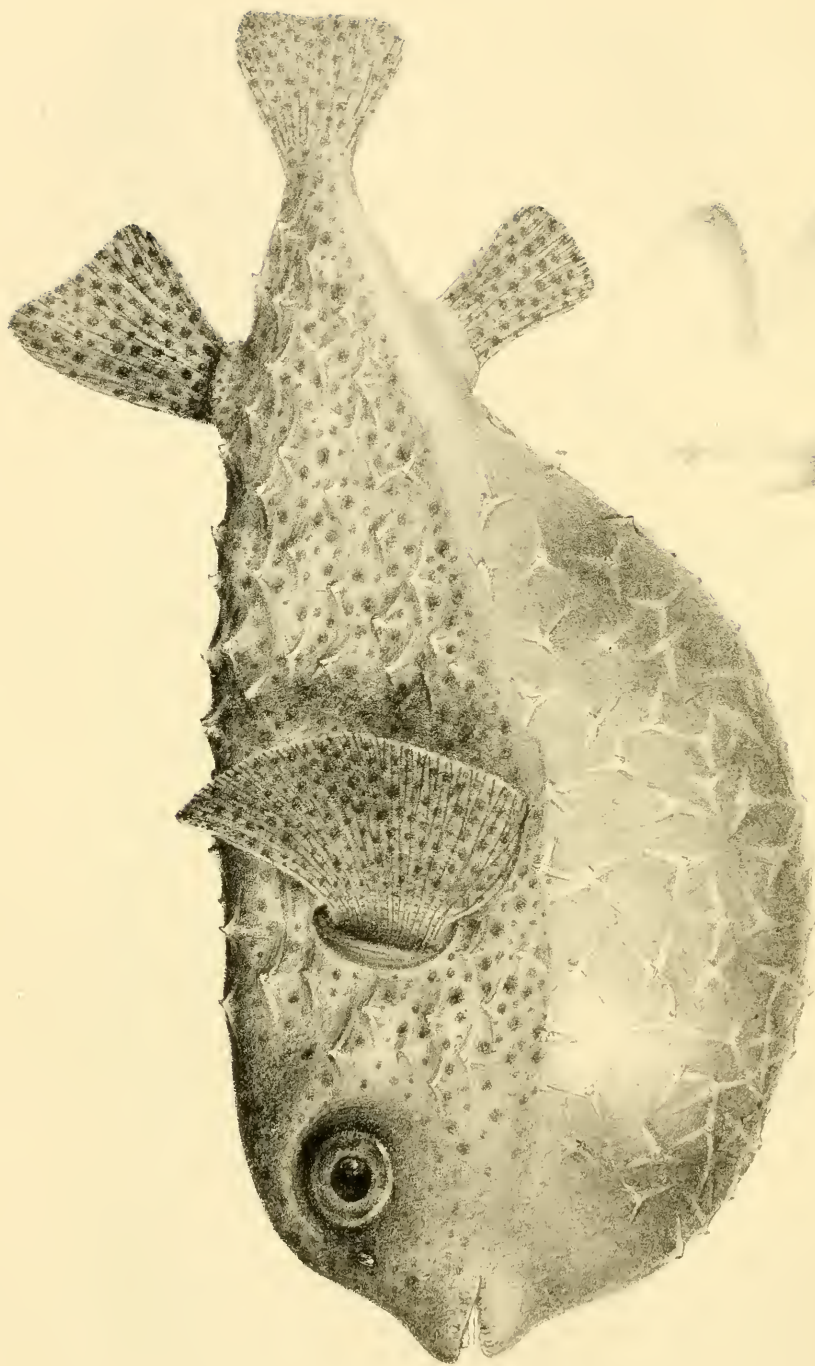
Colour dull slate, inclining to brown in large examples; darker above, paler on the sides: the belly white. The under side of the head is bluish white; the iris beneath the same; above dusky or blackish. The pupil is inky-black: the very distinct nictitating membrane pale brown or ash, and finely scabrous like the skin. The whole cornea of the eye is very hard and bony.

Fins dusky; the first and second dorsal, with the upper side of the pectoral fins, dark; the under side of the latter, with the ventral fins, pale.

The accompanying figure was taken from a female individual which measured two feet two inches and a half from the tip of the muzzle to that of the tail; the upper fork of which was eight inches long. The width of the head in a straight line from eye to eye was seven inches and a half.

\* —“With smooth cutting edges when the Shark is young, but serrated afterwards.”—Yarr. Suppl. 2. p. 63.





## TAB. XIII.

## DIODON RETICULATUS, L.

*Sapo grande.*

GREAT TOAD-FISH.

CHAR. GEN.

Corpus physetico-globosum, spinis cuticularibus undique echinatum. Maxillæ, dentium vice, osse nudo indiviso instructæ. Vesica aërea magna, antice biloba.

*Obs.*—Pisces regionum calidiorum, subtropici, ignavi, lenti, voraces, vix edules, malæ famæ, torvi visu. Aëre absorpto tument inflati, et supini super aquam inertes vage feruntur.

CHAR. SPEC.

D. ovatus, ventricosus, dorso planatus, superne pinnisque nigro-punctatus: spinis rariuseulis, brevissimis, crassis, triquetro-pyramidatis, inconspicuis, hebetatis, vix extantibus; radicibus tripartitis, reticulato-intertextis.

D. 12; A. 11 — 13; P. 20 v. 21; C.  $\frac{1}{1} + X$ ; Vertæ. 22.

*D. reticulatus*, Linn. Syst. Ed. 10<sup>ma</sup>. 334. n°. 2. — Syn. Fish. Mad. p. 193 (omissis synonymis. Lac. et Cuv.).

*D. Atinga*, β. Ejusd. Ed. 12<sup>ma</sup>. I. 413.

*D. tigrinus* var. Cuv. Mém. Mus. IV.—R. Anim. ii. 367, note.

*Ostracion subrotundus*; aculeis undique brevibus triquetris raris. Art. Syn. 86. n°. 19; Gen. 59. n°. 16.

*Orbis* muricatus et reticulatus, Will. 155. t. I. n. 7. opt.

*Longit.* =  $1\frac{1}{2}$  — 2 — pedalis.

*Tempus*, æstate, autumnno.

*Locus*, prope littus: rarior.

THE *Diodontidæ* or Toad-fishes, “les Gymnodontes” of Cuvier, consisting chiefly of the genera of *Diodon* and *Tetrodon*, compose a group or family remarkable alike for singularity of aspect, and complexity of structure and relation. Together with the *Balistidæ* they compose an aberrant order leading from the true fishes towards the Sharks, called by Cuvier *Plectognathi*: a word\* devised to indicate their principal distinctive character; which consists in the union of the maxillary with the intermaxillary bones, and in the immoveable articulation by suture of the palatal system with the skull. This order is externally distinguished

\* Πλεκτόγναθοι, jaws knit together or connected: from πλεκτός nexus, and γνάθος maxilla.

further from the true fishes by the concealment of the opercles, and the branchial rays and gills, by the integuments; and from the Sharks, to which, in the imperfection of the jaws and ribs, and in the softness of the bones, they indicate an approximation, by the single branchial cleft, and general structure, which is that, with the above exceptions, of the true fishes; the bones, though soft, yet being in their structure truly fibrous. Internally they have no *cæca*, but in general a large air-bladder; and externally the order is marked further by the want of regular or ordinary scales, and ventral fins. By this last character they may be instantly distinguished from the Acanthopterygian *Lophidæ*; to which, at various points, they seem at first sight closely linked. That this relation is, however, one of parallelism or analogy rather than of affinity, I am convinced with Cuvier; in opposition to the opinion of my late friend, Mr. Bennett,\* and the stream of former systematic writers. Though the voracity, the capability of inflation, the softened skeleton, the small branchial slit, the concealment of the gills and opercles, the button-shaped nasal pedicle, the pedicellate fins, the form of body, and the skin-armour of certain *Plectognathi*, find their antitype in some or other of the *Lophidæ*; yet the general structure of these last, the distinct formation of the palatal arches and the jaws in all, and the nature and position of the teeth in some, together with the impossibility of separating the more anomalous *Cheironectes* from the less doubtful *Lophius*, using these epithets in allusion to their natural affinities,—all these considerations show sufficiently that the general bias of the *Lophidæ* is away from the Chondropterygian series of fishes, whilst that of the *Plectognathi* is towards it; and that the degree and kind of their relation finds its correct expression by the arrangement of each at corresponding points of two parallel series, rather than by placing both consecutively in one.

The two families which compose this order *Plectognathi* are easily distinguished from each other by the structure of their teeth and skin. The former in the *Balistidæ* are few in number, but distinct and of the ordinary sort; and the skin is divided into hard bony or rough compartments, rather than scales. The teeth in the *Diodontidæ* are united into one or two large bony masses in each jaw; and the skin, though generally armed more or less with spines, is itself even, soft, and naked.

The fishes which compose this latter family are all remarkable for their oddness of form and general grotesqueness of appearance. The Sun-fishes (*Orthogoriscus*) resemble rather mutilated halves of some deep sort of fish than perfect animals: and the Diodons and Tetradons or Globe-fishes remind one in their prickly armour of the Porcupine and Hedgehog; or, when inflated, take the form of a balloon or globe. In reference to this peculiarity, Dr. Roget, in the first volume of the fifth Bridgewater Trea-

\* See Zool. Journ. iii. 372, 373.



tise, has observed, after Cuvier in the *Règne Animal*, vol. ii. p. 366, "Diodons and Tetrodons are remarkable for being provided with the means of suddenly assuming a globular form by swallowing air, which passing into the crop, or first stomach,\* blows up the whole animal like a balloon. The abdominal region being thus rendered the lightest, the body turns over, the stomach becoming the uppermost part; and the fish floats upon its back, without having the power of directing itself during this state of forced distension. But it is while lying thus bloated and passive at the mercy of the waves, that this animal is really most secure; for the numerous spines, with which the surface of the body is universally beset, are raised and erected by the stretching out of the skin: thus presenting an armed front to the enemy, on whatever side he may venture to begin the attack."—Fifth Bridgew. Treat. i. 433.

In the month of July 1836, passing in a boat along the shore about one hundred yards off the beach of Caniso, a village to the eastward of Funchal, I observed one of these fishes, of the sort here figured, floating helplessly on the surface, but in a state of partial inflation, and so retaining the usual position in the water, and not lying belly-upwards. When seized by the hand, it made scarce any effort to escape, though slipping once or twice away from its mere sliminess. It lived for about half an hour after being taken into the boat.

This fish, though far from common, is tolerably well known to the Madeiran fishermen, by whom it is occasionally captured, either floating as above described, or in their shore-nets, or still more rarely with a hook. They regard it with dislike, affirming it to be a great "ladraõ" or thief, robbing their lines in fishing of the bait: but this accusation is probably transferred, without much positive authority, from the more common little "Sapo" of the shore, *Tetrodon marmoratus*, Nob, in which this habit is notorious. Its weight and unwieldiness are very great in proportion to its bulk: and its power with the jaws appears commensurate with its voracity; their large bony plates, and the general strength and firm-built structure of the head, enabling it to crush with ease any kind of food received into its wide and capacious mouth. The size and transverse shape of this, its thick and blubbery lips, the clumsy form, the breadth

\* It does not appear, however, that this crop is capable of receiving even temporarily the food, as in those birds (the Turkey for example) in which it is equally inflatable by absorption of air. Cuvier calls it first incorrectly "leur estomac;" but adds immediately, "ou plutôt une sorte de jabot très mince et très extensible qui occupe toute la longueur de l'abdomen en adhérant intimement au péritoine, ce qui l'a fait prendre tantôt pour le péritoine même, tantôt pour une espèce d'épiploon. Lorsqu'ils sont ainsi gonflés, ils culbutent; leur ventre prend le dessus, et ils flottent à la surface sans pouvoir se diriger; mais c'est pour eux un moyen de défense, parceque les épines qui garnissent leur peau se relèvent ainsi de toute part."—Cuv. R. An. ii. 366.—The passage to this sac is by a sphinctral orifice at the entrance of the gullet. It has no communication with the gills except by way of the mouth through this orifice. It should be called "the air-crop."

and thickness of the head and shoulders, stern impending eyebrows, and dark gloomy colours, combine in giving to this fish a most repulsive aspect. I cannot find that it is ever eaten even by the poorest classes : and the name of “Sapo,” or the Toad, expresses something of its ugliness of aspect, alluding more particularly to the flatness or depression of the head and back, and width of mouth.

Though long well-known to virtuosos and collectors, and admirably figured long ago from a stuffed specimen by Willughby, this species of *Diodon* seems to have been ill-understood by modern ichthyologists ; owing principally to Linnæus, who, having characterised it properly in his tenth edition, was induced, unfortunately, by Gronovius in his twelfth to reduce it, and another probably distinct species, the *D. echinatus* of his tenth edition, to the varieties  $\beta$ . and  $\gamma$ . of his *D. Atinga*, a much smaller species, “of the size of a rather large goose-egg,” says Artedi ; and which is figured by Willughby t. I. 8, f. 1, and probably f. 2.\* Artedi mentions that he saw the specimen which he describes “in the Green Dragon at Stepney :” and few astrologers or Sidrophels of former times were, like such places of resort for mariners, unfurnished with at least some species of the tribe ; forming a pendant to the stuffed Alligator, which fills so conspicuous a place amongst the mysterious apparatus of a conjurer’s *penetralia*.† This might indeed be rather owing to the ease with which the skins of these fishes are removed from their bodies and preserved, than to the local abundance of the species anywhere. Yet it is singular that, of the country of a species so long ago well known and figured as the subject of this chapter, I can find no more certain record than Linnæus’ vague “Habitat in India.” Unless indeed quite recently, it has not been detected in the Mediterranean, or on any of the coasts of Europe ; and in any case it can scarcely be a common species elsewhere, or this uncertainty would not exist. Madeira, therefore, for the present seems its proper native country.

Ælian‡ alone, amongst the old Greek writers, mentions by the name

\* Cuvier (Mem. Mus. IV.) refers to both these figures of Willughby for his *D. rivulatus*. His *D. tigrinus* with unspotted fins, is better for the present kept distinct from the subject of this chapter, although he blends their synonyms : quoting under it, Will. t. I. n°. 7. with the remark, “Il ne diffère guère du tigré que par ses nageoires, qui sont mouchetées comme le reste de son dos.” Meantime the older synonyms of Artedi and Linnæus are quite safe for the present fish ; being both founded on Willughby’s excellent figure t. I. n. 7. with spotted fins.

† The association between wonder at uncouth or strange forms, and awe, arresting first, and chaining the attention by the sense, and so rendering the mind an easy and obedient captive to the purpose, has not been lost on these sagacious practisers. Another form of the self-same selfish charlatanism has evinced itself by an affected or loose-reasoning contempt for all outward accessories, in a diluted age, characterized by its shallow, mere materialistic modes of argument and thought.

‡ Lib. xii. cap. 25.—“The *Toxotes*, which is in the same (Red) Sea, resembles an *Echinus* ; for it has solid long spines.”

of *Τοξότης*, the *Archer*, some Red-Sea species of the genus ; but his description will not allow us to identify it with the particular kind here figured, and which I now proceed to describe.

Shape unwieldy, heavy-looking, ovate or pear-shaped ; large and thick at the shoulders, pointed towards the tail ; the back flat, and straight from above the eyes to the dorsal fin, whence it descends a little to the root of the caudal fin : the breast and belly very convex and protuberant, even when not inflated. Front descending rather steeply before the eyes. Mouth very slightly prominent, wide and transverse like a Toad's, with thick and flabby or blubbery lips, wrinkled or rough with small papillæ ; furnished within with a large thick and strong bony plate, of a single undivided piece, in front of each jaw : the outer edge of this bone in both jaws is raised into a sort of lip or margin ; behind which is a roughened carious-looking groove or channel which separates this raised bony edge from a flat-topped gibbous rude sort of disk, divided into two compartments by a sufficiently distinct but perfectly inseparable suture, reminding one of *Tetrodon*, to which there is here an evident approach. This disk and the raised outer border are of a whiter more compact bone, more approaching to enamel, than the rest.

The eyes are large, oval, prominent, but with bony projecting brows, giving them a peculiarly gloomy stern expression. They are placed laterally, not far behind, but considerably above the corners of the mouth. The nostril is a sort of shallow cup-shaped fleshy wart, or flat-topped caruncle, resembling a *Peziza* or *Phacidium*. The disk of this caruncle is of a loose flabby cellular texture ; and a vertical section shows its pedicle to pass through a hollow cavity immediately beneath the cuticle, and to be rooted on the bottom of this cavity : but I failed in discovering either in the disk or pedicle of the caruncle itself any perforation ; or in the large cavity among the bones, beneath and around, but chiefly behind it, the usual plaited pituitary membrane. Notwithstanding, we have evidently here another highly curious, and, as far as I know, unobserved analogy developed between these fishes\* and *Lophius piscatorius*, L., in which, as M. Cuvier remarks, "Les narines, par une singularité remarquable, sont portées, comme des champignons, chacune par un petit pédicule : la tête de cette espèce de champignon contient la cavité de la narine, qui s'ouvre, comme à l'ordinaire, par deux petits orifices."†

The situation of this caruncle is in the usual place of the nostrils, about one quarter of the distance from the fore corner of the eye to the tip of the upper lip.

Whole surface uneven with hard prominences and depressions or compartments caused by its spines ; these forming, with their roots, a complete sort of bony case or armour underneath the cuticle, which is itself thin, soft and perfectly naked, smooth and even. The spines are distant, strong, short, thick, blunt, conic or triangular, bony knobs ; their points directed backwards ; nowhere above an eighth of an inch long, and scarcely, except from injury, protruding through the cuticle, though sufficiently apparent to the touch ; reduced upon the nape, cheeks, throat, breast, and belly, to mere tubercles. They spring from the centre of generally three strong and broad grooved and ribbed bony roots, spreading pyramidally under the cuticle, like three props placed to support a weight, but at a very low elevation, being nearly altogether in one plane. These roots

\* I have observed the same thing in *Tetrodon* ; but in *Balistes* or *Caprisicus* the nostrils are as usual.

† Cuv. and Val. Hist. i. 472.—See also vol. xii. 347.

or rays interlace and cross each other in a curious reticulated manner. On the sides and back the root extending forwards is the longest; but on the breast and belly they are all three equal. On the nape some of the spines have four or even five-rayed roots; and the last upon the back, behind the dorsal fin, has only two, placed astride over the fleshy root of the tail. The lips and muzzle before the eyes, and the fleshy base of the caudal fin, are the only parts unfurnished with this armour.

The branchial opening is a single semi-lunar vertical cleft, furnished with a loose valvular skin or border within, close before the base of the pectoral fin, which is very large and broad or rather vertically oblong, deeper than long, and placed high up the side on a level with the eye at about one third of the distance from the muzzle to the root of the caudal fin. When expanded, its outer edge forms a segment of a circle, and is quite even and entire.

Dorsal fin seated on a sort of hump or pedicle near the hinder extremity of the body; subtriangular, and middle-sized.

The anal fin nearly corresponds in position with the dorsal; but is a little backward, smaller, and more inclined to oblong.

The caudal fin is small, trapeziform, simple, and truncate.

The angles of the dorsal, anal, and caudal fins are rounded; and the rays of all are strong and broad, much branched and barred; but buried and concealed in a thick leathery skin. Their outer rays are more or less crooked or distorted.

It is almost needless to remark that all the rays are soft and flexible; not spinous. Yet both the first and last or outer rays in all the fins are simple or unbranched.

Upper half of the body with the whole head and fins, dusky, approaching to black on the top of the head and back, and freckled or mottled with numerous distinct small round black spots. Sides paler, greyish, with the spots larger and more distant. Under lip, throat, breast, and belly, of a dead milky white, except a dusky band extending across the throat like a cap-string: quite free from spots. The iris is pale brassy, clouded with dusky brown. The whole inside of the mouth is white.

On dissection, the mass of the intestines and size of the whole fish appear enormous when compared with the smallness of the fleshy part or muscle of the body. The intestine is very voluminous and large. The air-bladder is large, placed in the fore-part of the belly, with the parietes excessively strong and thick, or almost cartilaginous, opaque, and of a pearly or satiny white: deeply bilobed forwards, or like two pears joined together sideways in their thick broad parts; with a singular round convex or lid-like protuberance at the broad hinder end. I could not discover any communication or canal between it and the gullet. It is tied to the backbone by strong fibrous sinews proceeding from the fork of its two ovate obtuse lobes on the upper side. The membrane which lines the air-crop above-mentioned becomes, when dried, of a fibrous cottony consistence. The vertebrae were twenty-two, including, as usual, that from which originate the caudal fin-rays: all had large, broad, foliated *apophyses* beneath. Their substance, though soft, is truly fibrous; and they are remarkably white.

The weight of this fish, notwithstanding its paucity of flesh, is very great in proportion to its bulk or length. The example here figured, which was also the largest I have seen, and measured twenty-five inches in length, weighed sixteen pounds and a half. The air-bladder is figured proportionally reduced.







## TAB. XIV.

## PRISTIURUS MELANOSTOMUS, BUONAP.

*Leitão do Mar.*

## THE BLACK-MOUTHED DOG-FISH.

## CHAR. GEN.

Rostrum productum, elongatum. Pinna caudalis simplex, elongata; margine superiore cum dorso continua, bifariam squamoso-serrata. Pinnæ dorsales duæ, subposticæ; prima pinnis ventralibus, secunda pinna anali subposteriore. Dentes in utraque maxilla conformes, laniiarii, tenues, basi utrinque denticulis aucti. Narium lobi simplices, parvi, triangulares. Fissuræ branchiales posteriores supra basin pinnarum pectoralium. Spiracula post oculos distincta.

*Obs.*—Omnia Scyllii, præter rostrum angustius, magis elongatum, caudæque marginem superiorem serratam. Species unica, cum Scylliis veris diu confusa, minor, extra-tropica, subocellatim maculata, maculis seriatis s. catenatis. Narium lobi ab ore et inter sese distincti. Pinna caudalis apice subdeflexa.

*P. melanostomus* (Buonap.), Müller et Henle, Plag. p. 15.

“*Scyllium melanostomum*, Buonap. Faun. Ital.; *Scylliorhinus melastomus* et *Delarochianus*, Blainv. Faun. Franc.; *Sq. (Scyllium) annulatus*, Nilss. Prodr.; *Sq. prionurus*, Otto, Consp.; *Galeus melanostomus*, Raf. Caratt.; *Sq. catulus*, Gunn. Dronth.”—Müll. et Hen. l. c.

*Scyllium Arctedi*, Risso, Hist. iii. 117. f. 5; Cuv. R. Anim. ii. 386, *note*.

The Black-mouthed Dog-fish, Yarr. ii. 375.

*Longit.* = 2 — 2½ pedes.

*Tempus*, primo vere (Febr. Mart.)

*Locus*, in mediis profundis: rara.

THE genus *Scyllium*, of which *Pristiurus* is a late dismemberment, is remarkable amongst the Sharks for the spots or markings of the species; most of these fishes being altogether plain or uniform in colour. From *Carcharias* and *Lamna*, the only genera with which, from the want of spiracles, it is in danger of confusion, it may be summarily distinguished by the simple instead of forked tail.

Two species of this genus, besides the proper subject of this chapter, have been long well-known, though ill-defined by European ichthyologists; and inhabit both the Mediterranean and British seas. Of these, the Small-spotted Dog-fish (*Sc. canicula*, Cuv.), Yarrell, ii. 367, is, Mr. Yarrell says, “one of the most common species on our shores, particularly along the southern coast.” The ventral fins in this are pointed behind, or “cut

obliquely," just as in *Pristiurus melanostomus*; but the lobes of the nostrils are large, and united across into a sort of flap or curtain before the mouth, which they partly overhang. The other species, the Large-spotted Dog-fish (*Sc. catulus*, Cuv.), Yarrell, ii. 373, has the lobes of the nostrils distinct or separate, like *Pristiurus melanostomus*; but the ventral fins are truncate or "cut nearly square behind;" the body is more bulky, and the spots less numerous and larger than in *Sc. canicula*. By these characters the species will be easily recognized, should either of them, which is not improbable, occur hereafter in Madeira.

The σκυλίον of Aristotle (Z. i. 3, 4, 9) appears to be sufficiently identified with the modern genus *Scylium*, by what he says of their anatomy in relation to their horny egg-cases, and by his remark that they are also called νεβρίαι γαλεοί; the former word being derived from νεβρός a fawn, or νεβρίς its hide, and conveying plainly an allusion to their dappled skin. I cannot find in Ælian or Oppian, however, either of these names; or any clear allusion to these Sharks under any other, unless, perhaps, by Oppian, where he mentions

γαλεῶν δ' ἐτερότροπα φῦλα  
Σκύμνοι καὶ λείοι καὶ ἀκανθία· ἐν δ' ἄρα τοῖσι  
ῥίνοι, ἀλωπεκία, καὶ ποικίλοι·

Opp. Hal. A. 379—381.\*

this last word appearing no inappropriate designation in reference to their varied markings.

I would restore from Aristotle the correct orthography of *Scylium*, the principal genus of this group, which has been neglected by Cuvier and others; and, following a hint afforded by a remark of Schneider,† I venture to suggest that Aristotle's σκυλίον is a much more probable etymology for the Latin *Squalus* of Pliny, which in pronunciation of the first syllable at least it would nearly resemble, than the common derivation of the word from *squalor*, filthiness; founded on the wholly false position, that "this fish is found to delight in impure and dirty places."‡

The more common species of *Scylium*, above referred to, are called by the French *Roussettes*, in allusion to their russet-brown or reddish colour.

\* A very similar enumerative passage occurs in Athenæus, VII. 43 (Dindorf. ii. p. 639). Ἀριστοτέλης δὲ εἶδη αὐτῶν (τῶν γαλιῶν) φησὶν εἶναι πλείω, ἀκανθίαν, λείον, ποικίλον, σκύμνον, ἀλωπεκίαν, ρίνην. It is difficult to conceive the Cilician poet not to have had this sentence in his eye when writing the verses above quoted in the text: for I cannot find it extant, nor indeed does it profess to be taken *seriatim* from the writings of the Stagyræ, though it may well be collected from them. And on the other hand, had Athenæus copied Oppian, he would scarcely have referred simply and directly thus to Aristotle.

† "Græcis hodie squalus stellaris audit *Squilo-psaro*, teste *Sonnini*, T. ii. p. 212."—Schn. Arist. Hist. Index, i. 541, voce Σκυλίον.

‡ Rees' Cyclop. voce *Squalus*.

The subject of this chapter, lately separated from these as a genus by the Prince of Musignano, on account only of its longer snout or muzzle, and the distichously serrate upper edge of the tail, is, according to Risso, called at Nice *Lambarda*; and, if I am right in the foregoing synonymes, "is well known," Mr. Yarrell says, "in the Mediterranean." In Britain a single individual only seems at present to have been observed; and in Madeira it is certainly one of our rarest Sharks, although well-known to the fishermen.

Mr. Yarrell's history and drawing of this species having been taken by Mr. Couch from a male, the accompanying figure with the following description are derived from a female individual, which was captured in the month of February, and measured two feet and a half exactly in length.

Muzzle much depressed and thin, and with the head as far back as the nape, quite flat above; obtuse, yet more pointed than usual; plentifully pored above and beneath; the pores arranged in symmetric figures; above, before the eyes, there is a single large suboval central group, divided by a narrow plain space down its middle, and behind this three smaller groups on each side placed in pairs; one close behind the first large patch; the second further back upon the nape, the pores of which are arranged in a double row; and the third lower down, behind the spiracles on each side. Beneath the head, the arrangement of the groups is best seen in the figure. Nostrils large, or obliquely elongated by a fissure, with the edges lobed or flap-like in the middle between the two orifices of each, and closing over each other; but the nostrils of one side have no connection whatever either with those of the other, or with the mouth; and, though placed rather nearer the latter than the tip of the muzzle, are quite separate and remote from both. Mouth and gape large, wide, triangular. Tongue smooth, broad and fleshy, like the human. Teeth in both jaws alike, small, sharp, acuminate, with one or two short denticles or toothlets on each side their base; arranged quincuncially, seven in a transverse oblique row, on a rather narrow band in each jaw.

Eyes remarkably elongated, elliptic-oblong; their sockets extend considerably beyond the eyeballs, which are longitudinally oval, like the pupils. The longitudinal axis of the sockets is four or five times greater than the vertical, and is one twenty-fourth part of the whole length of the fish.

Spiracles rather large, conspicuous; close behind the hinder canthus, and about the size of the pupils of each eye.

Shape of the body elongated, slender, no-where cylindric, but even close behind the pectoral fins deeper than broad, and at the ventral fins decidedly compressed, becoming gradually more so towards the tail. Back plain and rounded, neither keeled nor grooved in any part; and there is no dimple or depression, either above or beneath, at the root of the tail. The last of the five branchial slits is short and small, and altogether above, not before, the base of the pectoral fins.

The fore-edge of these last, which, as usual in the Sharks, are set on horizontally, originates at the bottom of the last branchial slit but one. They are large, very broad, or square-shaped, and truncate.

The ventral fins begin a little way behind the ends or outer edges of the pectoral; they are oblong, rounded in front, acuminate or pointed behind, with the outer edge oblique, as in *Sc. canicula*, Cuv. (Yarr. ii. 372, vignette, right-hand figure), instead of truncate, as in *Sc. catulus*, Cuv. (Yarr. ii. 374, vignette, right-hand figure.) The hinder edge of each behind the vent is connected with the body nearly



half-way up by a skin or web; but not to the other. The example being a female, the ventral fins are unprovided with the elongated cylindrical appendage or clasper on their inner edge, exhibited in Mr. Yarrell's figure, ii. 375.

The first dorsal fin begins opposite the end of the ventral fins, and occupies the space which corresponds with that between their termination and the beginning of the anal fin; being also placed exactly at the middle of the distance from the tip of the muzzle to that of the tail. It is small, short, oblong, with the fore and hind edges parallel, and the top obliquely truncate.

The anal fin begins nearly opposite, or a little behind the end of the first dorsal, extending thence quite to the root of the lower part of the caudal fin. It is broad, or rather high, and rounded in front, thence gradually narrowing to a short point at the end. Its length equals that of the head to the first branchial slit, or rather more than half that of the tail.

The second dorsal fin resembles the first in size and shape. It is placed quite at the end of the back, just opposite the termination of the anal fin: both fins ending at exactly opposite points.

The front, as well as hinder edges of all these fins are thin and sharp, not broad and flattened, except the hinder edges of the two dorsal fins just at the base; where they are a little thickened, smooth, and polished.

Tail contained about three times and a half in the whole length, narrow-oblong, truncate, and a little deflexed at the tip; its upper edge straight, and continuous in the same line with the back; its lower, which is thin and membranous, expanding into a lobe or angle immediately beyond its origin at the tip of the anal fin, and again into another, after having contracted first into a deep notch or sinus, just at the tip. Above, immediately behind a point opposite the origin of its lower portion, begins, along its broad and thickened upper edge, a most curious and elegant doubly serrate scaly ridge, resembling some pattern in embroidery, and continuing for two thirds of its length, when it becomes narrow, faint, and disappears; leaving the rest of the upper edge of the tail above, plain, sharp, and simple. This keel or border is composed of a double row of imbricated, ovate, short, obtuse, harsh, prickly scales; diverging laterally, and placed alternately, like the leaves of a laurel-crown in antiques. They lie flat backwards, and their hinder edges are irregularly toothed. The space between the two rows is flat, shining as if varnished, and covered with similar, but vastly smaller, imbricated, prickly scales or points, irregularly placed, but all directed backwards.

The lateral line is straight as far as the end of the second dorsal or root of the caudal fin, where it disappears; recommencing lower down and further back, and continuing straight to the tip of the tail.

The skin of this Shark is somewhat rougher than usual, but is not used for polishing, nor is its flesh eaten. The only part used is the liver, from which they extract the oil.

Colour grey, with a ferruginous or purplish-brown tint, becoming darker or more dusky towards the back; the sides, from the head to the end of the first dorsal fin, mottled with two not very distinct rows of darker spots, intermingled and confused by smaller ones irregularly placed. The larger spots forming the rows are faintly ocellate or bordered with a pale ring, forming a chain. Behind the first dorsal fin they grow faint and altogether disappear; the rest of the body behind being nearly uniform in colour. Belly, throat, and muzzle underneath, except just round the tip of the latter, dirty white. Fins and tail uniform dusky brown; darker at the fore, and paler at the hinder edge. Iris a metallic greenish-blue or glaucous. Pupil brassy-opaline. Whole inside of the mouth and the tongue livid-bluish, or mottled dark-grey and white.

The smell of this Shark was excessively and nauseously fetid.



Along with the individual here described and figured, there were brought two eggs, which had been found in the bottom of the boat, in which it had lain mixed with other fishes; none of which, however, I was told, were Sharks. These eggs were oblong, compressed, and of the usual form and coriaceous substance of "Sharks' eggs;" but, instead of tendrils, had merely two very short and sharp points, one on each side, at the top. They were an inch and a half long, and half an inch broad; of a smooth shining surface, and deep tawny yellow-brown or horn-colour. Although, upon dissection, the individual which they accompanied did not prove to contain any others; I cannot doubt from the above circumstances, and other external local appearances of recent vascular action or excitement, that they had been deposited by it in its dying struggles in the boat: and since this conclusion is confirmed by their exact agreement with Risso's description (Hist. iii. 118) of the eggs of his *Sc. Artedi*, an outline sketch of one of them is added to the plate.

## DESCRIPTION OF TAB. XIV.

*Pristiurus melanostomus*, Buonap. from a female measuring  $2\frac{1}{2}$  feet in length.

f. 1. Profile of head of ditto, showing real depth of muzzle.

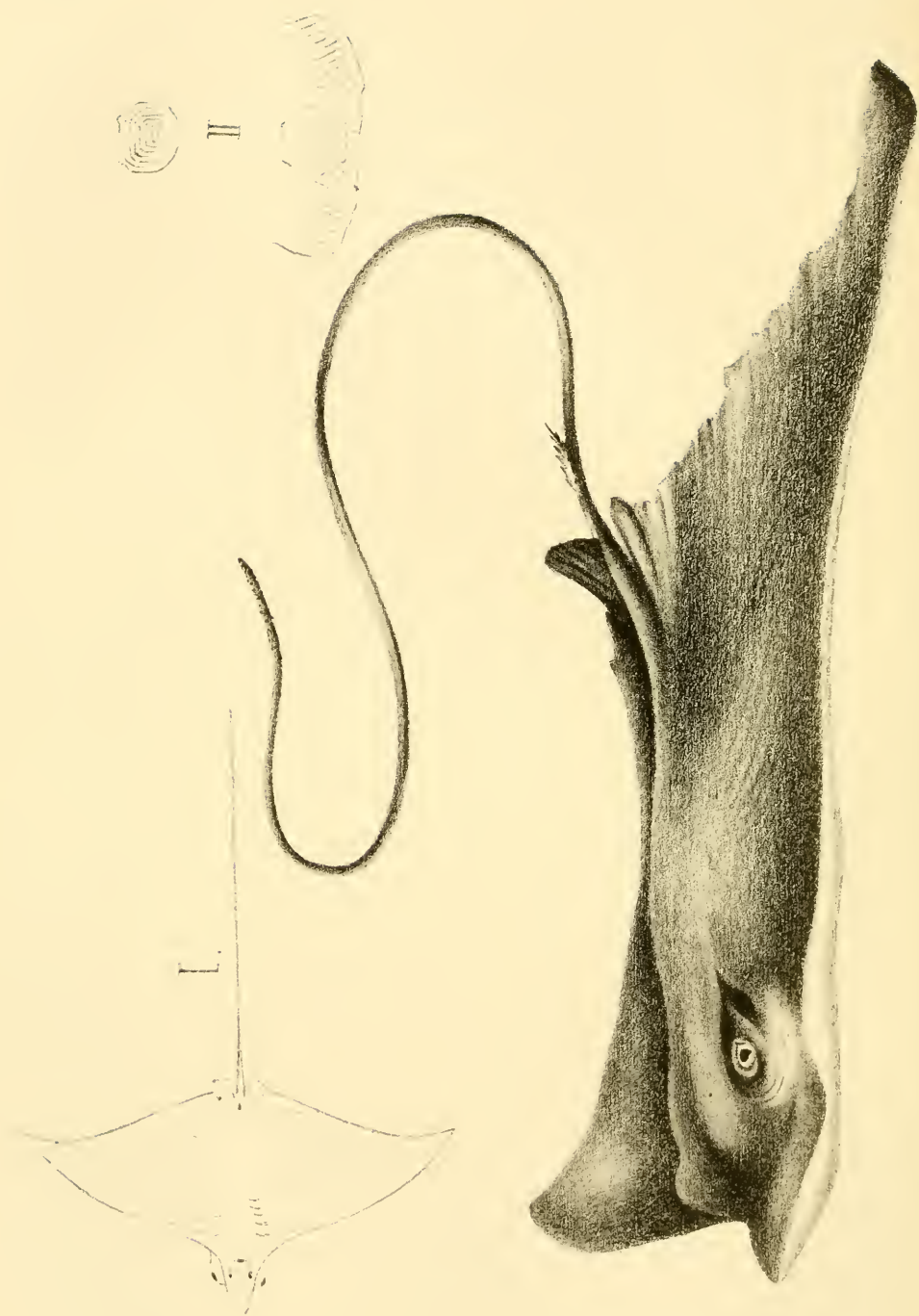
f. 2. Teeth of ditto, magnified.

f. 3. Part of ridge of upper edge of tail, magnified.

f. 4. Egg of ditto, natural size.







## TAB. XV.

## MYLIOBATIS AQUILA, RISSO.

*Dormideiro* : vulgo *Dromideiro* vel *Dromedario*.

THE EAGLE RAY.

## CHAR. GEN.

Caput distinctum, exsertum ; rostro simplici, ante pinnas pectorales alaeformes, latissime expansas, apice acutas, porrecto. Dentes utriusque maxillæ in pavementum centrale, osseum, coadunati, constricti : mediis transversis latis uniseriatis ; lateralibus rhomboideis triseriatis-tessellatis. Cauda longissima, gracilis ; basi supra pinna dorsali unica parva, spinaque serrata instructa.

*Obs.*—Pisces Raiiformes, cauda dempta latiores quam longi, maximi, regionum calidiorum incolæ, rarius edules : spinæ caudalis ictu gravius sauciantes.

## CHAR. SPEC.

M. supra olivaceo-fusca s. hepatica, immaculata : pinnis pectoralibus equilaterali-triangularibus, antice convexis : rostro obtuso : cauda corpore subduplo longiore.

*M. aquila*, Risso, iii. 162.—Mull. und Henle, 176.—*L'Aigle de mer*, Cuv. R. An. ii. 401.—*The Eagle Ray*, Yarr. ii. 445.

*Whip Ray*, Penn. iii. 88.

*Raia Aquila*, Linn. i. 396, n°. 6.

*Raia* corpore glabro, aculeo longo anteriùs serrato in cauda apterygia, Art. Syn. 100, Gen. 72.

*Aquila*, Salv. 147. t. 50.—Will. 64. t. C. 2. (copied from Salviani).—Secunda *Pastinaca* species, Rondel. 338.

*Αἰετὸς*, Arist. Hist. E. 2. 2.—Opp. Hal. A. 642.

*Longit.* corporis =  $\frac{3}{4}$ — $1\frac{1}{2}$  ped. =  $\frac{1}{2} \times$  latit. corporis =  $\frac{1}{2} \times$  longit. caudæ.

*Tempus*, vere.

*Locus*, in mediis profundis : rara.

THIS singular fish is very briefly mentioned by Aristotle and the elder naturalists ; yet the mere name of *αἰετὸς* or Eagle, occurring in such association as we find it in their writings, seems quite sufficient for the purpose of identification.

Aristotle enumerates it with the Ray or Skate, the Trygon, the Monk or Angel-fish (*ῥινή* or *Squatina*, Dum.), the Ox-fish (*βοῦξ*, *Cephaloptera*, Dum.) ; the Lamia (*Lamna*, Cuv.), the Torpedo, the Fishing-frog (*Lophius*, L.), and the Sharks especially belonging to the modern genera *Galeus* and *Mustelus*, Cuv. ; which compose his tribe of *τὰ σελάχη*.\*

\* Arist. Hist. E. 2. 1, 2.



Oppian speaks of it with the "voracious Dog-fish," the Shark-tribe, the Dolphin (*Delphinus*, L.), and the Seal, as being viviparous.

ἄλλ' ὅσα μὲν μαλάκεια φατίζεται,  
 . . . . . τὰδ' ὠφόροισιν ὁμῶς ὠδίσι μέλονται.  
 Ἐκ δὲ κυνὸς λάβροιο καὶ ἌΙΕΤΟΥ, ὅσα τε φύλλα  
 Κλήζονται σελάχεια, καὶ ἰχθυνόμενων βασιλῆων  
 Δελφίνων, φώκης τε βοώπιδος αὐτίκα παῖδες  
 Ἐκ γενετῆς ἀνέχουσιν ἐοικότες οἷσι τοκεῦσιν.

Opp. Hal. A. 638—645.

When it is considered further, that in the Mediterranean the Eagle-ray is a well-known fish, at Rome and Naples actually called "the Eagle" at this very day, and that, except the rare *Trygon Altavela*, there is no other fish in those seas to which the name would be appropriate,—the modern *Cephaloptera*, with its horn-like protuberances, finding a more probable appellation in the *βοῦς* or Ox of Aristotle and Oppian,\*—it will appear that Rondelet's objections to Salviani's determination on this point, chiefly because he found the flesh soft, whilst Galen, after Philotimus, affirms that of the *Aquila* to be hard like the *Lamia* and Conger, are, *pace tanti viri*, very futile. Indeed, the French naturalist seems to have been altogether in a bad humour whilst he wrote his history of this fish. He attacks his rival Salviani's figure on a point in which, like every other, it is assuredly far better and more accurate than his own; indicating by the greater sharpness of the muzzle, that it was taken from a fresh unshriveled young example: whilst he agrees with him in comparing its head to a Toad's; to which, were his criticism and his figure just, it would have much less resemblance than it actually has. Fabius Columna has not ill compared its head to a Swift's (*Cypselus murarius*, Tem. ; *Hirundo Apus*, L.) : Belon less happily to a Kite's or Eagle's. But Rondelet's and Salviani's reference is upon the whole the best; and by the Genoese, say Rondelet and Willughby, it is called *Pesce Rospo*, the Toad-fish, from its head, as well as *Pesce Ratto*, the Rat-fish, in allusion to its tail. It is occasionally called by this last name also in Madeira; though the appellation belongs rightly to the *Trygon Pastinaca*. Its French names are, according to Cuvier, *L'Aigle de mer*, *Mourine*, *Rate-penade*, *Boeuf*; and Rondelet adds those of *Glorieuse*, in supposed allusion to its pompous, stately motions in the water, *Tarefrauke*, *Falco*, *Erango*, and *Ferraza*: this last being the name by which Risso relates that it is known at Nice.

\* Arist. Hist. E. 2, above quoted; and Opp. Hal. α. 103, β. 141-166, γ. 139.—Rondelet (Hist. Pisc. 348), and after him Pennant (Brit. Zool. iii. 84), have suggested that Oppian's fish might be some enormous Skate or Ray (*Raia Batis*, L. or *R. oxyrrhyncus*, Mont.) But, although this might consist with the first of the passages referred to, it is negatived by the words *ἐνρύτατος πάντεσσιν μετ' ἰχθύσιν*, from the second.

This fish has only very recently been fully ascertained to be a native of the British shores. Mr. Yarrell writes me word that "a specimen occurred in Berwick Bay on the 11th of September last (1839), and was secured by Dr. George Johnston, who most kindly sent it to me. I exhibited this fish at the Zoological Society's meeting on Tuesday evening last, and had your (Madeiran) specimen on the table, to show their exact accordance."\* Before this discovery, its right of admission into the British catalogues rested merely upon Pennant's account of the tail of a Ray, brought to Mr. Travis of Scarborough, in the summer of 1769, "by a fisherman of that town, who had taken it in the sea off the coast, but flung away the body." This tail "was above three feet long, extremely slender and taper, and destitute of a fin at the end:" and from the subsequent express mention of tubercles in reference to the tail of a Sicilian fish possessed by Pennant, it is also plain that in this respect the Scarborough fish agreed with *M. Aquila*; in which this part is perfectly free from tubercles, and merely rough or scabrous, chiefly towards the end.

On the other hand, the tail which Pennant had received from the Sicilian seas, "corresponding with the description Mr. Travis gave," but "entirely covered with hard obtuse tubercles,"† belonged doubtless to a *Cephaloptera*; a genus, in which the tail is not only long and slender, but also more or less tubercled. It appears from Mr. Thompson's remarks in the Proceedings of the Zoological Society for 1835, vol. iii. p. 78 (quoted in Brit. Fish. ii. p. 446), that an example also of this latter genus has occurred upon the southern coast of Ireland.

The Eagle-ray is very imperfectly known to the fishermen, and by no means common in Madeira. It occurs occasionally to the westward of Funchal along the southern coast, and is taken in the months of March and April. On the sandy shore of Porto Santo these fishes are said to be more common. Oil is extracted from their liver, but the fish is not eaten; and from its worthlessness, no less than from their apprehension of the severe wounds inflicted by its tail-spine, the fishermen are never eager, even when captured, to receive this fish into their boats or carry it ashore.

Shape transversely rhombic, like a bird with the wings expanded, twice as broad as long, flat, but with the back very thick and convex in the middle, like the nape and head; thinner towards the root of the tail and sides. Wings (pectoral fins) narrow and pointed at the tips; thick, especially towards the head, yet sharp-edged in front, falling backwards in an even convex curve from the sides of the head or neck behind the eyes, and becoming gradually thinner-edged towards their tips, which are slightly recurved; their hinder margin concave just within the tips, then curving outwards with a gradual sweep towards the middle, thin, membranous, and irregularly notched or jagged throughout. Their base equals in

\* See Proceed. Zool. Soc. 1839, vii. 145.

† Penn. iii. 38: Flem. Brit. An. i. 170: Yarr. ii. 446. By an oversight in the last-named work, this character is transferred from the Sicilian to the Scarborough specimen.

length their fore or hinder margins ; each wing being thus very nearly equilaterally triangular.

Head and nape raised high and convex above the general level ; the former with the sides, in which are situate the eyes and spiracles, steep or vertical, with the fore margin of the wings originating in its middle just behind and below the eye ; and again in front descending rapidly between and before the eyes to the tip of the much depressed, yet thick and greatly prominent muzzle.

Eyes large and prominent, just before and above the base of the wings, placed laterally at the fore end of a prominent ridge, which forms over and before them a gibbous protuberant eyebrow, on each side of the head, which is a little hollow at the top between the eyes. Muzzle greatly depressed below the level of the head, yet thick ; flat underneath, sharp-edged, somewhat flaccid, soft or fleshy : though generally speaking, broad and rounded, it inclines, especially in young or smaller individuals, and whilst the fish continues fresh and moist, rather to a point or angle at the tip ; as well expressed by Salviani in his figure. In larger or in less recently captured examples, it is blunter and more rounded ; but in all states and stages the muzzle projects conspicuously and prominently before the general outline of the fore margin.

Spiracles very large ; each within an oblong elongated ear-like cavity immediately behind the eye, on the sides of the head or neck.

Branchial openings as usual in the Rays, five short transverse slits behind each other, quite underneath the body ; in a row on each side behind the mouth.

Mouth opening transversely quite beneath at the base of the muzzle in a line with the base of the fore margin of the wings ; closing very compactly, and then resembling a cross bar between two longitudinal ones, as in the letter H ; the large nostrils being at the fore-end of the two longitudinal lines, on a level with the eyes. The fore or upper lip is fleshy and flaccid ; slightly bilobed or retuse in the middle, with the edge thin and ciliate. Lower lip entire-edged, but notched slightly in the middle ; within, thickly marked with slightly waved diverging striae. There are no teeth on the edges of the jaws : but far back, in the middle of the upper, is a single bony plate, nearly flat and smooth, of which the visible part is broader than long, and marked with pale transverse lines, turning backwards at the sides. In the lower jaw is a single similar antagonist plate, but flatter and longer than broad. At the front of the plate in the upper jaw, and lying backwards, is a fleshy flap-like veil or skin, semi-circular or tongue-shaped, and with the edge strongly ciliate ; and behind the plate in the lower jaw at the entrance of the gullet are six short fleshy cilia, in a transverse row or curve.

Removed from their fleshy integuments, both these bony plates are found to be alike longer than broad, and composed of flattened teeth, arranged in three longitudinal bands, and close-set like a pavement.

Those of the broad middle band or compartment are in a single row, transversely oblong, like the steps of a stair-case, and slightly arcuated in front. They are from four to six times broader than deep or long. The side-compartments are greatly narrower, and composed of three rows of small lozenge-shaped teeth, set in a tessellated manner in oblique lines ; the outer ones the largest. In the accompanying plate, these parts are represented as they appear *in situ* in the recent fish, looking into the mouth. Their structure is illustrated by Mr. Yarrell. They act upon each other somewhat like two mill-stones, and are generally more or less worn or hollowed towards their front. From this resemblance has originated the Provençal name of "*Mourines*" for these fishes ; as well as their generic one from *μύλη* or *μύλος*, a millstone, and *βαρίς*, a Ray or Skate ; and which would be more correctly written *Mylobatis*, though it may still pass in its present form, deriving it immediately from *μυλίας*, *molaris*.

Tail flexible, very long and slender, subcompressed and slightly keeled beneath, somewhat square towards the tip, which, when perfect, ends in a fine almost hair-like point, but is usually from injury more or less obtuse. The whole resembles the thong of a coachman's whip. It originates a little within the hinder margin of the wings, and its length is about twice the length of the body from the tip of the muzzle to the hinder margin; rather exceeding the width from tip to tip of the wings. Quite at its base, on the upper or dorsal side, is placed the small triangular dorsal fin, which is rounded at the tip, truncate behind, nearly twice as long as high, and does not reach quite so far as the end or tip of the ventral fins, or much beyond the general outline of the hinder margin of the wings. Close behind it on the tail are one or sometimes two flattened two-edged straight acuminate spines, from half an inch to an inch long, with their edges barbed, or retro-serrate from the point, lying flat backwards along the upper side of the tail; and, though proportionately small in this fish, capable of inflicting severe lacerated wounds, and rendering the fish an object of some terror to the fishermen. When captured, it lashes and writhes the tail backwards and forwards; endeavouring to strike and tear with these its formidable weapons.

The ventral fins are on each side the root of the tail, oblong, rounded or truncate behind, and extending a little beyond the general outline of the hinder margin. In the males, such as the example figured, they are furnished at their inner edge with a small obtuse flattened clasper, scarcely so long as themselves; and these appendages are connected with each other at the base by a skinny fold or flap passing under the root of the tail.

There are no tubercles or prickles on the tail or elsewhere in this fish; but the top of the head, with a certain space all down the middle of the back, is generally in both sexes slightly rough or scabrous: the roughness, which is formed of remarkably distinct or subremote raised points, spreads a little over the base of the wings, breaking irregularly into patches. The remainder of the upper surface, like the whole of the under, is quite smooth. The tail is rough all round towards the tip: but only so on one side or the other, above or beneath, forwarder; becoming quite smooth towards its base.

Young male individuals are sometimes altogether smooth; even with the tail so throughout.

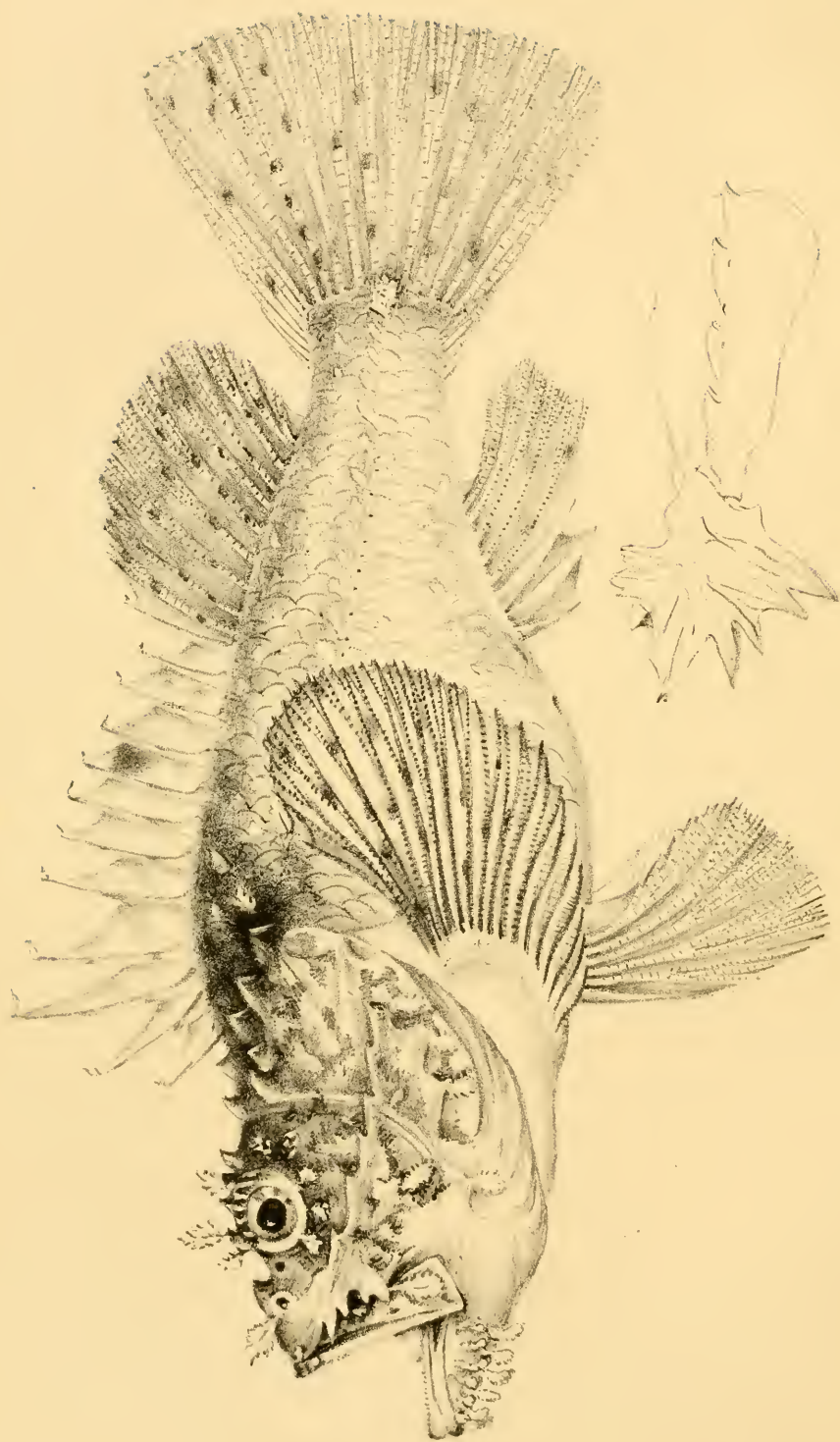
Colour above an uniform greenish or olive liver-brown; with here and there some bronze or coppery tints: beneath, pure white, except towards the hinder margin, which is brown. Tail dark brown. Iris rich glaucous green, clouded with dark brown, forming a ring on the green ground.

The individual figured was a male, measuring two feet eight or nine inches from tip to tip of the wings, and four feet five or six inches from the tip of the muzzle to that of the outstretched tail: of this last quantity the tail measured nearly three feet. The body was four inches thick, or rather deep, just behind the head, in a line from tip to tip of the wings.









## TAB. XVI.

## SCORPÆNA SCROFA, L.

*Carneiro.*

## GREAT RED SCORPION-FISH.

## CHAR. GEN.

Corpus squamosum ; caput exsquameum, magnum, deforme, horrens, tetre aculeatum, cavernosum, compressum ; utroque lacinioso. Oculi approximati. Operculum bispinosum. Præoperculum quinque-dentatum. Os rictusque ampla : maxillis vomereque palatinisque scobinato-dentatis. Pinnæ nudæ, exsquameæ : dorsali unica ; caudali truncata ; pectoralium radiis inferioribus simplicibus. Membrana branchiostega septem-radiata.

*Obs.*—Pisces magnitudine mediocri, regionum calidiorum, subtropici, forma præsertim capitis cute nuda laciniosa obducti spinisque obvallati, oreque rictuque latissimis monstrosi ; colore latissimo rubro insignes ; edules. Caro albissima ; sed durior, minusque sapida. Vesica aëris nulla. Cæca pauciora. Anus pinnæ anali solito magis distat.

## CHAR. SPEC.

*S. major*, valde laciniosa, rubra, variegata s. lentiginosa ; capite rivuloso-marmorato : pinnis pectoralibus dorsalique postice caudalique superne fusco notatis s. punctatis ; dorsalis, medio fere bima-culate, spinis primoribus valde inæqualibus : capite subelongato : suborbitario anteriore quadriden-tato, dentibus productis, binis, duobus intermediis minoribus : squamis majusculis, læviusculis.

D. 12 + 9 ; A. 3 + 5 ; P. 1 + VIII. + 10 ; V. 1 + 5 ; C.  $\frac{3 + VI.}{6 \vee. 7 + V.}$

M. B. 7 ; Sq. lin. lat. 24 ; Vertæ. 9 abd. + 15 caud. = 24.

*S. Scrofa*, Linn. I. 453. n°. 2.—Cuv. R. An. ii. 166.—Cuv. et Val. iv. 288.

*S. Scrofa* et *S. lutea*, Risso iii. 370, 371.

*S. tota rubens, cirris plurimis ad os*, Art. Gen. 47, Syn. 76.

*Scorpius major* Rondeletii, Will. 331. *Scorpius Salviani*, t. X. 12 (copied from Salviani).

*Scorpius* et *Scorpæna*, Rondel. 201.

*Scorpius* s. *Scrofano*, Salv. 199. Pl. 73.

Σκορπίος πτεράγιος, Hicesius apud Athen. Lib. vii. 115. (Ed. Dindorf. ii. p. 699.)

*Longit.* = 1 — 1½ ped. = 3 — 4 × alt. = 3 × longit. capitis.

*Tempus*, vere, æstate : sed per totum fere annum.

*Locus*, in rupibus submarinis ; vulgatiss.

Var. *a. obesa* ; major, miniaacea, pallidior, maculis obsoletioribus ; corpore altiore s. obeso ; oculis fere majoribus.

*S. Scrofa*, “ variété d’un beau rouge de laque,” Risso, loc. cit. p. 371.

Icon, Tab. nost. 16.

*Carneiro de Fora*, Maderensi-Lusitanice.

*Longit.* = 1½ — 1½ ped. = 3 — 3½ × alt. = 3 × longit. capitis.

Hab. in profundioribus, a littore procul.

*Obs.*—*S. lutea*, Risso iii. p. 371. n°. 286 status videtur magis lutescens.

Var. *β. histrio*; minor, sanguinea, coloratior, distinctius maculata; corpore subgraciliore; oculis fere minoribus.

*S. Scrofa*, Risso, loc. cit. p. 370. n<sup>o</sup>. 285.

*S. Histrio*, Jenyns, loc. cit. icone optima.

Icon, Salv. et Will. loc. cit. tt. 73 et X. 12.

*Carneiro de Rolo*, Maderensi-Lusitanice.

Longit. usque ad  $1\frac{1}{4}$  ped. =  $3\frac{3}{4}$  —  $4 \times$  alt. =  $3 \times$  longit. capitis.

Hab. in vadis, prope litus.

THE CARNEIRO of Madeira is a common market fish, which from its uncouth form and brilliancy of colour fails not early to attract the observation of a stranger. It is, moreover, altogether unknown to the British shores; and standing at the head of a peculiar group, requiring separation from the Cuvieran Gurnards or *Triglidae*, of which these seas contain some kinds known yet imperfectly even to the Ichthyologist, it will not be perhaps less interesting than expedient to describe it first.

The naturalists, however, of the Mediterranean shores have long been well acquainted with this fish, which is apparently a common species also in that sea. For although Aristotle says too little of his *σκορπίος*\* to serve for its identification, this deficiency is well supplied by Athenæus: who first quotes Hicesius, distinguishing two kinds of *σκορπίος* in terms well corresponding with the two (*Sc. Scrofa*, L., and *Sc. porcus*, L.), at this day known to Ichthyologists, and both inhabiting the Mediterranean; one a pelagic fish and rufous (*πυρρόδης*), the other blackish, dusky, or dark-coloured (*μελανίζων*), and inhabiting the shallows: and then produces, from Numenius, a passage in which the *σκορπίος* is called red (*ἐρυθρόδης*). He further says, from Aristotle, though I cannot find the passage in his extant works, that it was armed offensively with spines (*πληκτικὸς*)†; and cites Epicharmus applying to it the epithet of varied (*ποικίλος*); adding, himself, that it was a solitary fish and feeds on seaweed (*μονήξης καὶ φυκοφάγος*). Hence, when he introduces, afterwards, the word *σκόρπανα* in conjunction with that of *σκορπίος*, saying that every one knows they differ both in taste and colour, he appears to mean particularly by the former word, Hicesius's blackish kind of

\* He, however, enumerates it (B. ιβ. 13) in a list of fishes having many *cæca* (*ἀποφύδαες*) next after the Perch, and immediately before the *κίθαρος*, (which I take to be some species of *Trigla*, L., and quite distinct from Galen's fish so called,) and the *πείγλη* or Red Mullet; from which association something of its true affinity might be inferred. He elsewhere says (E. θ. 2) that it breeds twice a year; and again (θ. ιε. 1) speaks of it as being both a pelagic and shore fish. His *σκορπίς*, or rather *σκορπίδης*, (E. θ. 5.) is, I think, merely a false reading, though of as old a date as Athenæus, whom it puzzled, for *σκορμειδης*:—which word is actually extant in some MSS., and is a much more likely fish to occur in the context than even the pelagic *σκορπίος*. Salviani thinks, however, that this *σκορπίς* was a female *σκορπίος*.

† So Ovid:—

“Et capitis duro nociturus Scorpius ictu.”—*Ilalicut*. 116.

σχορπίος (*S. porcus*, L.), as by the latter he undoubtedly denotes the red or rufous kind (*Sc. Scrofa*, L.), the Carneiro of Madeira.

Oppian, in like manner, alludes both to its spines and twofold race :

Σχορπίος αἰκτῆρ, διδυμον γένος . . . . —'Αλ. α. 171.

and again to its prolific nature,

Σχορπίος αὖ τετόρεσσι φέρει βέλος ὠδίνεσσι.—*Ibid.* 591.\*

And its identity with the fish *Scorpius*, of the Romans, is established by the line from Ovid in the note at the foot of the last page.

Salviani says that, by the modern Greeks, this fish is called *Scorpidi*; and that its common name at Rome was, when he wrote, *Scorfano* (*Scrofano*); at Marseilles, *Scorpena*. Rondelet mentions more particularly, that the yellow sort, as he terms it, was called *Scorpena* at Marseilles; the black (*Sc. porcus*, L.), which Salviani says was called at Rome *Scrofanello*, *Scorpeno*. A more usual French, or, at least, Provençal name, appears to be *Rascasse*: though Risso gives that of *Capoun*, as used at Nice to designate *Sc. scrofa*, L., applying that of *Rascassa* to *Sc. porcus*, L.; and in this latter point he is confirmed by MM. Cuvier and Valenciennes. It is remarkable that this last named species, which, upon MM. Cuvier and Valenciennes' authority, exists not only in the Mediterranean and on the other side of the Atlantic at New York, but also at Teneriffe, has not at present been detected in Madeira.

Before describing the Carneiro, which, though very far from being first, either in point of excellence or systematic order, is yet one of the most striking, and the earliest noticed in this work of the fishes usually admitted to the better furnished tables of Madeira,—some observations on the circumstances here affecting the condition of such fishes, *gastronomically*, may be opportunely introduced.

Generally speaking, then, the influence of the seasons on the flavour, juiciness, or firmness of Madeiran fishes, is much less than in Britain. This is indeed merely the natural result from the little change† comparatively in the seasons themselves, causing less variation in the temperature of the water and the supply of food. The cause being diminished, the effect, of course, will be decreased proportionally. Hence it is that so many of the fishes in Madeira, *e. g.* the Cavalla (Mackerel), Chicharro (Horse Mackerel), Tainha (Grey Mullet), Carneiro, Requeime, Alfonsins, Garoupa, Cherne, Pargo, Goraz, and even Red Mullet vary so little perceptibly in quality throughout the year.

\* And again to its spines, B. 457—459.

† The late Dr. Heineken, on the accuracy of whose meteorological observations complete reliance may be placed, gives 84° F. for the maximum, and 50° for the minimum of four years' observations on the atmospheric temperature of Funchal. See Edin. Journ. Sci. New Series, I. 39.—In Britain the mean annual range is more than twice as great.



The general rule, however, here as elsewhere holds; though, for the reason stated, in a modified degree; viz. that all the Madeiran fishes are in best condition for the table, and also in their richest colouring, in the breeding season, or when, as technically called, in milt or roe: and, on the contrary, are the poorest both in tint and flavour just after depositing the spawn. They sooner, than in England, nevertheless, recover their condition afterwards: and I have reason to suspect that some breed twice, and consequently are in proper season twice a year. This period, whenever it is accurately ascertained, will be recorded under each particular species. That of the Carneiro is in the summer. I have had the female in the month of August full of roe, and in great brilliancy of colouring.

But another point to be attended to, so far as the climate will permit, and of importance secondary only to the season, is the time when, after capture, the fish should be prepared for the table. And generally speaking, this will be dependent on the depth at which the various kinds may be habitually caught. "It may be considered as a law," says Mr. Yarrell in the *British Fishes*, "that those fish that swim near the surface of the water have a high standard of respiration, a low degree of muscular irritability, great necessity for oxygen, die soon—almost immediately, when taken out of the water, and have flesh prone to rapid decomposition. On the contrary, those fish that live near the bottom of the water have a low standard of respiration, a high degree of muscular irritability, and less necessity for oxygen; they sustain life long after they are taken out of the water, and their flesh remains good for several days. The Carp, the Tench, the various Flat-fish, and the Eel, are seen gaping (gasping?) and writhing on the stalls of the Fishmongers for hours in succession; but no one sees any symptoms of motion in the Mackerel, the Salmon, the Trout, or the Herring, unless present at the capture. These four last named, and many others of the same habits, to be eaten in the greatest perfection, should be prepared for table the same day they are caught; but the Turbot, delicate as it is, may be kept till the second day with advantage, and even longer without injury; and fishmongers generally are well aware of the circumstance, that fish from deep water have the muscle more dense in structure—in their language, more firm to the touch,—that they are of finer flavour, and will keep longer than fish drawn from shallow water."—Yarr. *Brit. Fish.* i. 22, 23.

Allowance must be made, of course, in these remarks for differences of temperature and greater general warmth of climate. But it will assuredly be found that whilst the delicate Red Mullet (*Salmonete*), the little Atherine or Sandsmelt (*Guelro*), and Sardinha, with a multitude of other fishes of a soft and tender fibre in Madeira, require to be cooked as soon as possible after their capture; on the other hand, the firm or hard-fleshed kinds, such as the Cherno, the Badeijo, the Ribaldo (*Poma-*

*tomus*), and perhaps the Carneiro, will be brought to the table in greatest perfection after being kept some hours, when the heat or season will permit.\*

For the Carneiro in particular, Rondelet further recommends boiling as the best mode of preparation for the table. Except when small, it is indeed a fish of too fibrous, hard, and dry a muscle for frying or broiling. The flesh is delicately white and flaky; but still, prepared in any way, it is in general an inferior, tough, insipid kind of fish.

The Carneiro is in shape thick, short, and clumsy; with the head and shoulders enormously and disproportionately large and thick, but with the body small comparatively, and compressed. The back is moderately arched: the belly either is quite straight from the throat to the commencement of the anal fin, or frequently, as when gorged with food, and especially in female fishes when in spawn, swollen and prominent; the ventral line ascending rather steeply or rapidly from the ventral fins to the root of the caudal fin. The greatest depth is at the shoulders, and equals from one fourth to nearly one third of the whole length. The greatest thickness at the same part is about one fifth of the whole length, not equalling the depth.

Head very large and clumsy, of a heavy massive, rounded, or subcubic form, being nearly as thick as deep, and its length exceeding the greatest depth of the body: its upper outline very uneven and irregular; the eyes, which are approximate, projecting high above it in a singular manner: the whole armed with prominent strong spines and bony ridges, and of a deformed and monstrous aspect. Muzzle rather short, thick, and obtuse, extending twice the diameter of the eye before it, to the tip of the lower jaw, when the mouth is closed: with a transverse hollow immediately before the eyes, and a prominent strong hump or protuberance forwarder. The nostrils are two plain, round, or oval orifices, of which the anterior is nearly half way from the eye to the tip of the muzzle; the hinder close before the eye.

The mouth and gape are, like the branchial opening, very large; yet the gape scarcely reaches to the eyes: the lower jaw is rather longer than the upper, with a callous bony tubercle beneath the tip. Both jaws round the edges, and the palatines, are armed with bands; the vomer with a patch of brushlike teeth. The large and prominent tongue is smooth: the maxillaries are plain, broad, and even at the ends; which when the mouth is closed, reach back to a level with the hinder edge of the orbit.

Eyes oval, rather small, about one sixth the length of the head, placed about half way between the nape and tip of the muzzle, but nearer to the latter than to the point of the opercle. The space between them at the top of the head is deeply hollow, grooved, and not quite equal in width to their own diameter. The orbits project considerably above the profile, and are armed with three unequal strong recurved bony prickles above, and with two little groups, one below the other, behind, descending towards the cheeks; each of the latter consisting of from two to four or five minute erect short conic points rather than spines, scarcely penetrating the skin, and placed close together. The uppermost of these two groups is firmly fixed, belonging to the lower end of the *posterior frontal* bone: the lower group is moveable, and loose in the skin, or merely cutaneous;

\* When carried up into the country in hot weather, immersion for some hours, before cooking, in one of the cool fresh springs or streams which are the boast and luxury of Madeira, will be found greatly to restore the flavour and consistence of all fishes. Some of the more firm-fleshed kinds may be thus kept with great advantage till the next day after capture and transport.

being of that dermal system to which Cuvier, after Bakker, assigns the name of *Supertemporals*. Of the three supraorbital prickles, the first and third, at the fore and hind corners of the eye respectively, are strong and more or less recurved: the second or middle one is obsolete. Between the orbits run two faint bony even ridges; which after giving off a little behind, but on a line within, the third supraorbital spine, another single slightly recurved prickle, diverge, and terminate upon the nape in a conspicuous pair of firm-fixed recurved spines, placed one before the other; the hinder being very large and strong. A solitary, nearly erect, or conic spine, stands over or within the inner edge of each fore-nostril. The anterior suborbital is strongly ribbed; the ribs from four to six in number, diverging obliquely two and two in pairs, upwards and downwards, from its base or articulation behind with the next suborbital underneath the fore corner of the eye. The points or extremities of the two uppermost ribs are rendered obsolete or inconspicuous by the junction with the *nasal* bone; although the second of them, reckoning downwards, is the longest and most prominent forwards of them all, running out to the upper fore-angle of the suborbital: but the two to four below this are produced beyond the suborbital plate itself, into a corresponding variable number of large and strong conspicuous marginal teeth or spines, lying over the maxillary, and for the most part in the same plane with it; but in this they vary, as in number, often on the two sides of the same fish; though normally there are four of them, growing two and two, in pairs. They are also, like the ribs, liable to be confused by accessory spines or prickles, given off upon their back. The uppermost and lowest of these four marginal teeth are the strongest: and it is one or both of the two between these which is often wanting.

Extending backwards from the root or point of divergence of these suborbital ribs, there runs across the cheeks, a little below each eye, descending backwards obliquely, a strongly but irregularly armed bony keel or ridge, aculeate throughout, and terminating in a strong spine, which has a smaller on its back or base, and is the highest and much the largest of the five subremote marginal spines of the preopercle, of which the two lowest are obsolete or inconspicuous, and the two above them nearly equal. The opercle is produced high up obliquely towards the nape, into a flat or membranous parabola-shaped point, and is furnished with two diverging even ridges, each ending within its edge in a strong sharp flattened adpressed spine. Above the middle of the uppermost of these, at the junction or axil of the opercle with the body, is a group of three moveable hooked spines, placed near together in a triangle; the two smaller ones in front belonging to the supracapular bone; and the third, much longer one, behind, which forms the apex of the triangle, and is at the origin of the lateral line, being the upper edge and point of the *scapulary*. Half way between the two supracapular spines and the eye, ranging in a line with the lower of them, and the upper group of little fixed ones on the lower end of the posterior frontal bone, there is a single large, distinct, hooked, recurved spine, fixed firmly, and belonging to the skull: and again, behind this, a little higher up, but in the interval between it and the two supracapular spines, and so immediately below the larger, hindmost nuchal spine, there is another smaller prickle; which is moveable, and belongs to a dermal plate, like that of the two supracapular prickles, over the base of which it partly imbricates. The two nuchal spines above it, both project above the outline of the nape, and terminate the armour of the head or skull behind, on either side.

The humeral bone immediately above the axil of the pectoral fins, ends in a strong flat adpressed spine or point, directed upwards, and sufficiently conspicuous externally.

The branchial membrane is large and conspicuous, with seven strong rays.



The pectoral fins are extremely large, ear-shaped, or subparabolic, rounded at the tips, strong and fleshy, with the margin scalloped. Their first ray is simple, but not pungent: the eight next branched and barred as usual: the ten lowest forked or simple, thick, and fleshy, and curiously barred with close-set rings or joints, like a fibre of an *Oscillatoria*. None of the rays project beyond the web. Their length, measured as usual from the upper axil or base of the first ray, varies from one fourth to one fourth and a half of the whole length: but measured from their lower axil, or base of the last ray, it is about one third and a half of the same, or nearly corresponding with the greatest depth of the body. When fully expanded, they are twice as high as broad, covering something more than the whole depth of the side. Their lower rays advance considerably forwards underneath the throat; giving them their ear-like form; and bringing their lower axil considerably before their upper. Their tips reach to or beyond the middle point of the whole length of the fish.

The ventral fins are rather small, placed a little behind the lower axil of the pectoral, on the most prominent part of the belly. They are but little shorter than the pectoral fins, and yet their tips in general do not reach nearly so far back. In shape they are suboval, often irregularly truncate. Their last ray is connected to the body by a web.

The dorsal fin begins forward on the nape, above the supracapillary spines, and extends nearly to the root of the caudal fin; its spiny portion forming two thirds of its whole length. The bases of the two first spines are approximate; of the others remote: the three first spines increase rapidly in length; the second being considerably longer than the first, and the third longer than the second, and equal to one half, or even to two thirds of the depth of the body below it. The following decrease very gradually and regularly till the eleventh, which is the length of the first, and considerably shorter than the twelfth or last. The web behind each spine is deeply notched. The soft rayed portion is about twice as high as the hinder end of the spiny part, and rounded behind. Its last ray is double as usual, and webbed down to the back.

The anal fin begins opposite the commencement of the soft part of the dorsal, and corresponds with the anterior half of the same. It is remarkably small, resembling in size and shape the ventral fins; but is more produced and pointed. Its last ray is webbed to the body merely in the axil at its base behind: and a considerable space, fully twice as great as behind the dorsal fin, intervenes between it and the base of the caudal fin. Another peculiarity is the distance before it of the vent; which is one third or one fourth the distance from the base of its first ray to the ventral fins, instead of being close before it as in most fishes. The three spines are strong, appearing broader alternately on different sides of the fish, owing to the sublateral attachment of the web; the second being broadest on the right side, and the third upon the left. The second and third spines are of nearly equal length.

Caudal fin simple, truncate, or rather rounded and fan-shaped, twice as long as broad, or rather deep, at the base: but, when spread out, its depth at the extremity equals its length; which is between one fourth and one fifth of the whole length of the fish.

The whole head, cheeks, opercles, maxillaries, throat, breast, and belly even behind the ventral fins, the fleshy base of the pectoral, and the whole of all the fins are entirely naked or bare of scales. Those of the body are, however, large in comparison with the other fishes of this tribe, which are its more immediate allies (e. g. the *Requime*, *Boca negra*, and *Rocaz*); and, as Artedi after Rondelet observes, have more resemblance to those of snakes than fishes. Their direction is obliquely upwards, instead of as usual horizontal; and though offering a slight re-

sistance to the finger when drawn in a contrary direction, they are nearly smooth at the edges.

The lateral line, commencing at the hinder strong scapular spine, descends a little at first, and then continues straight and even to its end. It is composed of twenty-four scales, each marked by a raised line or tube, and alternating pretty regularly with the ordinary scales; of which there are consequently about forty-five rows between the edge of the opercle and the base of the caudal fin.

The whole head and body of this fish are furnished with numerous fleshy, or rather skinny, pinnatifid, or jagged and toothed laciniae. The largest or most conspicuous of these are upon the head, and along the lateral line: but others are dispersed elsewhere. There is a pair of large ones in front of the muzzle; another rising from the inner and upper or hinder edge of each fore-nostril, at the outer base of its spine; and another overhanging the maxillary at the lower spine of the anterior suborbital. A row of five or six short ones fringes the eyeball above, growing on the *cornea* itself; and a larger one originates from each of the three superorbital spines, which it nearly conceals; the middle one being frequently enormously developed, especially in young fishes. A broad one also grows from the base of each of the five preopercular spines, which it also nearly hides. The lower jaw is also copiously fringed. Almost every one of the scales, which mark the lateral line, is provided with a large one: and, besides these more distinct pedunculate laciniae, a number of much shorter sessile, simple or entire skinny triangle-shaped flaps or points project from underneath the scales, especially upon the flanks. Behind the tip of each spine of the dorsal fin, except perhaps the last, there is a small lacinia, like a short pennon: but those of the anal spines are very obsolete. All these laciniae are compressed or flattened, thin and membranous; and the larger ragged ones float loosely in the water. They are proportionally more conspicuous and larger in younger individuals of middle size than in adult full-sized fishes: but their size and copiousness are always characteristic, and give a very peculiar aspect to the fish, increasing the grotesqueness of its general appearance.

The colour of the whole fish varies from a full vermilion or cherry-red, to a more or less deep scarlet; pale pure rosy towards the throat, breast, and belly; the head and cheeks marbled, mottled, or variegated, like tortoiseshell, with dusky, and with brighter scarlet or orange on a pale rosy ground; the under jaw clear spotted on a rosy-white ground; the body for the most part plain, and always without distinct dark blotches, bands, or spots: but specked or freckled, rather than spotted or mottled, with bright orange, yellow, white, pale red or rosy, and a little brown or dusky on a red or scarlet ground. The soft part of the dorsal, the pectoral, and the caudal fins, are marked, however, with numerous distinct atrosanguineous, or dark-brown spots, chiefly arranged along the rays like bars: and on the web between the seventh and ninth spines of the dorsal fin, are generally two more or less conspicuous, large blackish or olive-dusky confluent spots or patches, characteristic of the species: though often one, as in the example figured, and sometimes both of these spots cannot be discerned. The anal, ventral, and lower portion of the caudal fins are generally immaculate or plain. The spinose fore-part of the dorsal fin is marbled with orange and scarlet, flecked with brown and paler clouds, and the spines are mottled or almost barred with brown. All the fins are more or less varied with yellowish or white. The iris is brilliant red and golden yellow. The inside of the mouth is pale.

Two states or varieties, depending chiefly upon age or size, may be distinguished of this fish, and are, in fact, admitted by the Madeiran fisherman: but they run so much into each other in respect to sex, locality, and season, as well as characters, that it had scarcely been de-



sirable separately to define them, might not the observation of isolated individuals lead possibly to their erroneous distinction into species. That which may be called the normal sort, since it comprehends the largest full-sized fishes from fifteen to twenty inches long, and which, therefore, constitutes the variety  $\alpha$ , is deeper in proportion to its length than the var.  $\beta$ : with the belly somewhat prominent or corpulent. The head, in consequence, seems shorter; and the eyes, though varying in this respect, are generally somewhat larger. The colours are altogether lighter or paler, often as if faded or deteriorated: the red approaches more to scarlet or orange, and the dark spots or bars of the fin-rays are faint or few, and even sometimes wanting. Such fishes are in general, but not uniformly females; and full-sized old or aged fishes of eighteen or twenty inches long, almost invariably present these characters. They are said to be caught in deeper water and further from the shore than the darker coloured, ruddy, or vermilion sort to be presently described, and hence are called *Carneiro de Fora* by the fishermen. *S. lutea* of Risso seems to have been founded on some extreme state of this variety.

The other sort, var.  $\beta$ , is a more slender or shallow fish: with the ventral line straight from the throat to the anal fin. The eye again varies in size, but is generally smaller. The head appears much thicker and longer, in consequence of its length greatly exceeding the depth; but it is not actually longer or thicker in proportion to the whole length of the fish. The colours are altogether darker: the red is a deep ruddy, cherry, or vermilion tint; and the orange and brown spots and markings are more clear and distinct. Such fishes are sometimes called by the fishermen *Carneiro de Rolo*, being caught nearer the shore or over sunken rocks, in shallower water than the others, which may account partly for their greater intensity of colour. I have seen them of both sexes and at all seasons: but of never more than fifteen inches in length, and they are more generally male fishes. In some respects they approach *S. porcus*, L., but are not to be confounded with that species; and if any ichthyologist feel tempted to consider them as equally distinct from the *S. Scrofa*  $\alpha$ , I can only add, that after long investigation, my own observations and opinions perfectly accord with the following remarks of MM. Cuvier and Valenciennes. After describing accurately the colours of the var.  $\alpha$  from a Sicilian example brought by M. Bibéron, these authors have remarked:—"il paraît qu'à un certain âge et en certaines saisons cette scorpène a des teintes plus jaunes ou plus brunes. Plus les individus sont jeunes, plus les marbrures et les rivulations qui varient le fond de leurs couleurs sont nombreuses, fines, et diverses; plus aussi leurs lambeaux charnus"—(and I may add their spines or prickles in appearance also)—"sont à proportion grands et déchiquetés."—Cuv. et Val. iv. 294.

In a female individual sixteen inches long and full of roe, of brilliant colours, and in high season, taken in the month of August, I found the liver small, the cæca nine in number, rather large but short, the intestine making only two volutions, the ovaria highly vascular, large and full of just formed eggs. There was no trace of air-bladder, and the peritoneum, like the whole of the viscera, and especially the liver, was pale or whitish.

Of the nine abdominal vertebræ, the four last only have apophyses beneath, of which those of the three last unite into a single strong bone, notched only at the tip, and winged behind. The first of the fifteen caudal vertebræ is indicated by its inferior apophyses being quite simple, or entire at the tip.

The individual figured was a male in milt, of the pale-coloured deep-shaped sort, captured at Machico in July; and measured seventeen inches in length, weighing three pounds and a half. The largest fish I ever saw of this kind was twenty inches long, and weighed five pounds and a quarter. In another taken in February of the same kind and weight, but only nineteen inches long, though proving when boiled quite an old fish, the stomach was enormously distended with a freshly swallowed Cuttle-fish (*Octopus vulgaris*, Lam.) of at least half a pound weight. This rendered the belly so prominent, that before dissection I supposed the fish, notwithstanding the season, to be in spawn: but it proved to be a male. Individuals, however, of only fifteen inches long have sometimes proved on boiling quite old fishes, and as tasteless, hard, and tough, as leather. Thus their goodness is dependent on their age: but their age cannot always be inferred with certainty from their inches.

MM. Cuvier and Valenciennes after relating on the authority of Brunnich, that this fish attains the length of two feet, and a weight of three or four pounds, and mentioning that M. de Martens, in his "Voyage à Venise," says, it sometimes weighs six pounds, give an amusing instance of the exaggerations and mistakes of copyists. Pontoppidan, the Norwegian Naturalist, says of his Marulke (*Sebastes Norvegicus*, Cuv.), that it was four feet long. Bloch, confounding the Marulke with the Mediterranean *Scorpana Scrofa*, copies this; substituting, however, for four feet, three or four ells. And lastly, Lacépède, putting for these German or Prussian ells of two feet each, French metres of three feet, and using the expression "more than four," completes the extension of a fish rarely exceeding eighteen inches, to a length of twelve or thirteen feet.

At Machico, the Carneiro is called frequently Rocaz or Roqueime. The example figured was unanimously pronounced to be a Rocaz by the fishermen of that place; and I suspect that their Requeime or Roqueime is properly the var.  $\beta$ , or Carneiro de Rolo.

The two sinistral suborbitaries of the example figured, cleared of their integuments, are represented of the natural size in the accompanying plate, below the fish itself.





THE BARNARD

## TAB. XVII.

## SEBASTES KÜHLII, NOB.

*Requeime.*

THE SOLDIER-FISH OR HOG-FISH.

## CHAR. GEN.

Corpus squamosum: caput squameum, magnum, aculeatum, subcavernosum, compressum, parcius laciniatum. Oculi approximati. Operculum bispinosum. Præoperculum quinquedentatum. Os rictusque ampla: maxillis vomereque palatinisque scobinato-dentatis. Pinuæ basi sæpius squamulosæ: dorsali unica; caudali truncata; pectoralium radiis inferioribus sæpissime simplicibus (excepto *S. Bougainvillii*, Cuv. et Val.), apice liberis. Membrana branchiostega septem-radiata.

*Obs.*—Omnia *Scorpæna*, præter caput (sc. genas operculaque nuchamque) squamosum; lacinias pauciores, aliquando nullas; suborbitaria paucidentata; pinnas basi plerumque squammulosas; dorsum antice fere gibbosum; aspectumque minus horridum, monstrosus; squamasque corporis minores. Vesica aërea sæpius adest: in nonnullis (*S. imperiali*, Cuv., *maculato*, Cuv. et Val., et *Bougainvillii*, Cuv. et Val.) deest. Species pleræque extratropicæ, læte coloratæ, rubidæ, edules.

## CHAR. SPEC.

*S. subovalis*, parce laciniatus; ruber, corpore maculis, capite strigis flavis fulvisve picto: ore intus pallido, gula superne macula rubra: rostro subproducto, acuto: suborbitaria antice bispinosa; carina subocularia aculeata: præoperculi spinis inæqualibus: pinnarum pectoralium axilla unispinosa, radiis omnibus simplicibus; dorsalis spina secunda tertiæque productis, apice appendiculatis; parte posteriore maxillaribusque nudis, alepidotis.

$$D. 12 + 9; A. 3 + 5; P. 17; V. 1 + 5; C. \frac{6 + VI.}{5 + V.}$$

M. B. 7; Sq. lin. lat. 25; Vertæ. 9 abd. + 15 caud. = 24.

*S. Kuhlîi*, Syn. Fish. Mad. p. 176.

*Scorpæna Kuhlîi*, Bowd. Exc. in Mad. p. 123.

*Longit.* subpedalis = 3 —  $3\frac{1}{2}$  × alt.

*Tempus*, per totum fere annum.

*Locus*, in mediis profundis; vulgatiss.

THE REQUEIME, though a no less common market species in Madeira than the Carneiro, of not inferior brilliancy of colour, taken moreover in abundance at all seasons, and still more frequently admitted to the table, has hitherto almost escaped the observation of the naturalist: the only extant notice of it, previous to my own, being that above referred to in the work of the late Mr. Bowdich; in which it is mentioned as “a new species of the *Scorpæna* of Schneider,” with a few brief notes of character and colouring. These were, however, insufficient to establish



it as a species: especially after the separation from *Scorpena* by Cuvier, of the genus *Sebastes*, in which Bowdich's erroneous observation, of the Requeime "having no fleshy appendices to the head or dorsal (lateral?) line," might, even in the absence of all notice of its scaly head or cheeks, have caused it to be placed. Failing, accordingly, to recognise it in any of MM. Cuvier and Valenciennes' descriptions of the species either of *Scorpena* or *Sebastes*, I some time ago proposed it as a new *Sebastes*, to which genus it belongs; retaining the specific name applied by Bowdich to it as a species of *Scorpena*, which denotes its dedication to the memory of Herr Kuhl, a zealous naturalist, too early lost to science.

In general aspect and colouring the Requeime much resembles the Carneiro. It is, however, a considerably smaller fish, rarely exceeding a foot in length; and is of a less grotesque appearance, a more shapely form, with a more pointed muzzle, and a smaller head. The small yellow spots upon the fins and body, and the stripes of the same colour about the head, are also obvious characters. The paucity of membranous laciniae, and the scaliness of the head, that is of the cheeks and the opercles, serve no less for its scientific than for its popular discrimination.

It will, however, be described best by continual comparison with the Carneiro.

Shape deeper in the middle, but more slender and pointed at both ends; and thus oval or elliptic, cutting off the caudal fin; not oblong. Back higher, gibbous arched and convex close behind the nape, like a hog's. Breast and belly straight, not corpulent or prominent. Head long rather than large, the muzzle before the eyes being considerably produced and pointed; bony, and armed with spines and ridges. Mouth and gape large, the latter reaching back nearly to the middle of the eyes; the lower jaw a little longer than the upper, which is strongly notched, whilst the lower has a tubercle at the tip beneath. Teeth and tongue as in the Carneiro.

The greatest depth is behind the nape at the tip of the opercle, or in a line with the base of the pectoral or ventral fins: it is contained three times, or in smaller individuals three times and a half in the length. The greatest thickness is nearly half the greatest depth: and the length of the head a little exceeds the whole of the same. The diameter of the eyes is about one fifth the length of the head. They are larger than in the Carneiro, and approximate, with a rather plain and shallow or flattened yet grooved hollow between them on the top of the head; but are not at all, as in the Carneiro, prominent above its profile. The interval between them does not exceed their half diameter: but the muzzle extends before them fully a diameter and half.

The general disposition of the spines and ridges of the head is precisely as in the Carneiro: but they are generally more straight and slender. The front suborbital has only two strong distinct conspicuous flat spines or teeth, pointing obliquely downwards, and lying over the maxillary; the lower being very broad and large. The suborbital ridge or keel, running below the eye, and ending in the uppermost of the five preopercular spines, is more distinctly raised and aculeate throughout. The marginal spines of the preopercle are unequal; the one below

the strong uppermost which terminates the suborbital ridge, being like the lowest of all, small and inconspicuous; whilst the third and fourth again are stronger, broad, and flattened. The uppermost of the two supercapulary spines is very small and inconspicuous; and the third posterior or scapulary spine, forming the apex of the triangle in this group, is much more remote from the anterior pair. The little groups immediately behind the eye, on and below the posterior frontal bone, are either indiscernible or wanting: but the large spine half way between the eye and the lower of the two supercapulary spines is present and distinct, though straighter and more slender and adpressed than in the *Carneiro*: and the humeral bone ends also in a more distinct and slender spine in the upper axil of the pectoral fins.

The nostrils, with the spine above the first, and the protuberance before it, are the same as in the *Carneiro*: but this hump or protuberance is much more obsolete; and when the fish becomes dry, several pores become apparent on the muzzle, which without caution are easily mistaken for one or other of the true nostrils, and which I have not observed in the *Carneiro*.

Of the spines from the eye to the nape, there is a very strong one at the fore corner of the orbit; and three close together, one behind the other, at its upper hinder corner: then a little backward, after an interval, a pair like those in the *Carneiro*, terminating the armour of the head behind.

The pectoral fins are very large, and when expanded, broadly rounded, and nearly as deep as long. The extremities of all the rays except the two or three first are free: and from seven to ten of the last are considerably produced beyond the web: but what is a still more remarkable character of this fish, and very anomalous, is that they are all perfectly simple or unbranched. They are also thickly annulate or barred.

The ventral fins are larger and more pointed than in the *Carneiro*. They are shorter, however, than the pectoral fins; their length being about three-fifths that of the head, or something more than one-fifth that of the whole fish.

The dorsal fin begins forward on the nape, over the scapulary spine. In extent and form it resembles that of the *Carneiro*. Adult or full-grown examples have the second and third spines, or sometimes only one of these, abruptly and enormously produced to a length from three to four or even five times greater than the first, or half as long again or twice as long as those immediately behind them: and these elongated spines are furnished with laciniae at their tips, like the *Barber* (*Anthias sacer*, Bl.): but in small or younger individuals the second and third spines are not produced disproportionately to the first; the third or longest being scarcely longer than the five or six succeeding spines behind it; which are in all cases of nearly equal length.

The anal fin in shape and position resembles exactly that of the *Carneiro*; but it is smaller and shorter than the ventral fins. The vent is also situate considerably before it. Its last ray is double or forked to the base, like the last soft ray of the dorsal fin: but it is free or not connected to the body by a web; which the last ray of the dorsal and ventral fins is, for a great part of its length.

The caudal fin is simple, truncate, slightly convex.

The whole head, with the exception of the muzzle before the eyes, the maxillaries, and the lower jaw, which are naked, is in this fish quite distinctly scaled. This is the case also with the belly, the base of the pectoral fins and breast quite up to the point of the throat: which parts, with the whole head in the *Carneiro*, it must be remembered, are wholly smooth or naked. The scales on the opercles and the cheeks advance no further forwards than the front of the eyes; and although small, are quite distinct and rough. Those on the body are also much smaller and rougher than in the *Carneiro*: and they terminate less abruptly at the

base of the caudal fin, though not extending up between the rays. In their arrangement they resemble those of the Carneiro.

The dorsal and anal fins, both in their soft and spiny parts, are wholly free from scales. But the pectoral fins are scaled up a little way in a semilunar manner at their base.

This fish is very sparingly and variably furnished with laciniae. Sometimes a few are visible about the head, over the eyes and nostrils, and along the suborbital ridge, whilst none can be discovered on the body: in other individuals none are discernible about the head, whilst some are distributed sparingly either along the whole course of the lateral line, or only towards its termination, at or near the root of the caudal fin. But in all cases they are inconspicuous.

The whole fish is of the brightest scarlet: and with the fins, especially the caudal, the soft part of the dorsal, and the anal, is spotted all over with distinct small yellow or olive-yellow, sometimes brownish, spots: the head is rather streaked or mottled than spotted with the same: the throat and under jaw are pale, and like the ventral fins, immaculate. The iris is golden, with patches of brilliant orange-red. The inside of the mouth is white, with a large red patch above and behind, quite at its back or at the entrance of the gullet.

The mass of viscera is small: the stomach of moderate size, but with its coats extremely thick and muscular. The pylorus has four large palmate *cæca*, of equal size and length. The liver is large, with one lobe more especially elongated: the gall-bladder is free, distinct, and large. The intestine is of considerable diameter, and makes two bends, or one volution. The air-bladder is rather large, quite simple, and globose, or short and oval: it has no communication with the œsophagus, but is fastened to the fore part of the stomach, and attached firmly all its length to the spine, from which, however, owing to the strength and toughness of its coats, it can be separated without rupture. The stomach is white: the liver, *cæca*, and intestine pale. The air-bladder in a fish nine inches long was one inch in diameter.

The first of the nine abdominal vertebrae is partially ossified and bent at an angle with the sphenoid bone of the skull: the two next vertebrae are very short: the four last are furnished with dilated or broadly winged apophyses beneath, which in the three last vertebrae become successively more connate, uniting in the last (ninth) vertebra into a single strong bone, notched merely at the tip, yet giving off two slender ribs, attached each to one of the two points of the tip. The first of the fifteen caudal vertebrae is known by its perfectly simple apophysis, without notch at the tip.

The usual average of size in the Requeime is not more than eight or ten inches: and the largest I have seen were only from twelve to fifteen inches long. One measuring in length twelve inches and three-quarters, weighed one pound and a quarter.

This is a somewhat better fish for eating than the Carneiro; and is more delicate, not only in consistence, but in flavour. The best method of preparing it for the table is by frying. It does not vary much throughout the year, but is, perhaps, most in season for the table in the month of January. Yet, under any circumstances, it is but a secondary sort of fish, held by the Portuguese in little estimation, and considered inferior to the Carneiro. It is said to live in deeper water than the Carneiro (*Scorpena Scrofa*, L.): being caught with lines of from one

hundred to two hundred and fifty fathoms, *i. e.* in a depth of from three or four to ten linhas, instead of from fifty to one hundred fathoms.

The Machico fishermen call the Requeime, Cantareiro or Galludo, and apply the names Requeime or Rocaz to the Carneiro; not distinguishing by name the true Rocaz, *Sebastes Maderensis*.

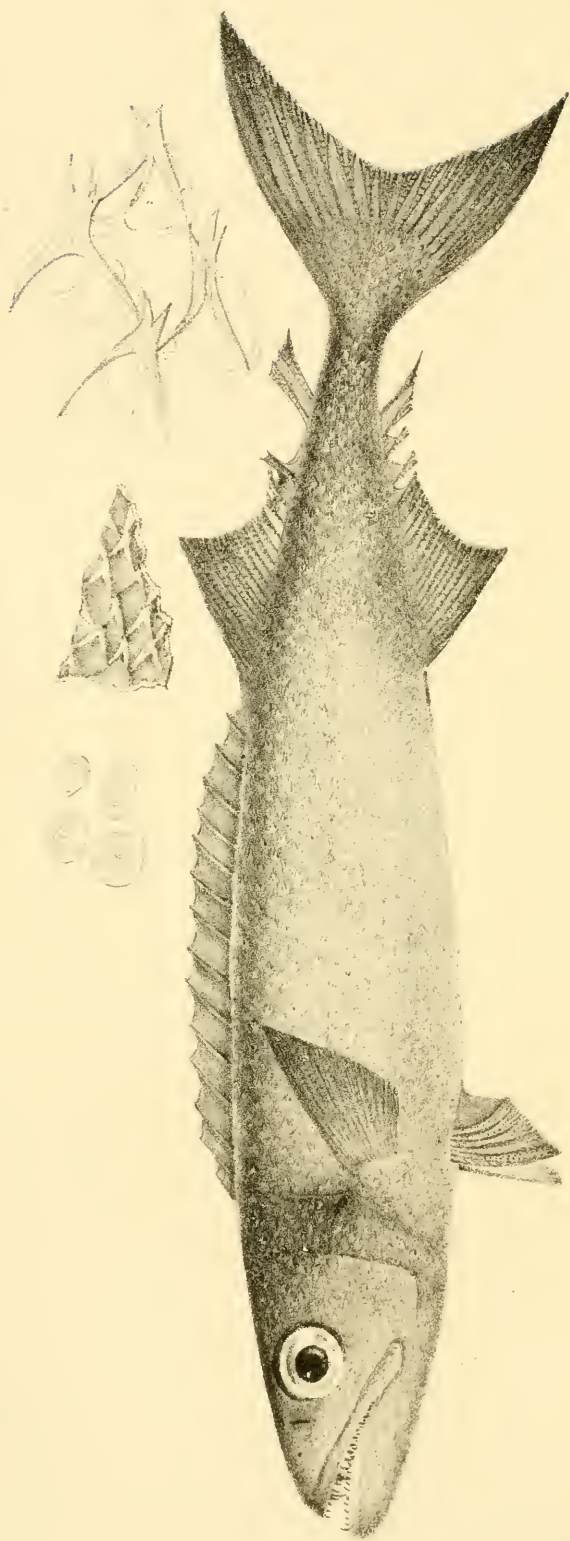
The armed head and colour have suggested one of the English names; and the hog-like elevated back and lengthened snout explain the other.

A representation of the two sinistral suborbitaries, taken from an individual which measured eleven inches in length, will be found at t. XXV. f. 2.









*Salmo gairdneri*

## TAB. XVIII.

## APLURUS SIMPLEX, NOB.

*Escolar ou Chicolar.*

THE OIL-FISH, SCOUR-FISH, OR PLAIN-TAIL.

## CHAR. GEN.

Corpus subelongatum, compressum, capiteque cute coriacea, retrorsum echinato-scabra asperum, postice utrinque simplex a. ecarinatum: abdomine carinato.

Caput magnum, simplex, inerme. Rostrum subproductum, maxilla inferiore longiore, apertura branchiali rictuque vastissimis. Operculum et preoperculum inermia, plana, integerrima. Dentes compressi, ancipites acuti; externi in utraque maxilla uniseriati subæquales; in superiore interni quibusdam anticis ad apicem prælongis; posterioribus vomerinis paucis, palatinisque uniseriatis minoribus.

Pinnæ dorsales duæ, numero radiorum subæquali; antica angusta, continna, æquali, longiore; secunda brevior triangulari, antice elevata, postice in pinnulas spurias secedente: pinna anali secundæ dorsali simillima. Pinnæ ventrales parvæ, normales. Pinna caudalis furcata. Membrana branchiostega septem-radiata.

*Obs.*—Omnia *Thyrsitis*, Cuv., præter cutis muriculato-asperæ structuram, et abdomen carinatum. Cutis coriacea, dura, squammuloso-furfuracea, spinellisque adpressis retrorsis radicatis echinulata. Species unica, notabilis: piscis oceanicus, regionis temperatæ, major, unicolor, vorax, edulis; carne oleo scatente, colliquante.

## CHAR. SPEC. idem ac generis.

A. simplex, Syn. Mad. Fish. p. 180. (March, 1837.)

1<sup>ma</sup> D. 14 v. 15; 2<sup>da</sup> D. 3 v. 4 + 13 — 15 + 11.; A. 2 v. 3 + 14 v. 15 + 11.;

P. 14; V. 1 + 5; C.  $\frac{8 \text{ v. } 9 + \text{IX.}}{7 \text{ v. } 8 + \text{VIII.}}$

M. B. 7; Vertæ. 16 abd. + 16 caud. = 32.

*Thyrsites acanthoderma*, Suppl. Mad. Fish. in Proceed. Z. Soc. 1839, p. 78.

*Tetragonurus? simplex*, Proceed. Zool. Soc. 1. p. 143. (December, 1833.)

*Longit.* = 3 — 5 ped. = 6 × alt.

*Tempus*, æstate, autumnno: sed per totum fere annum.

*Locus*, in alto, a littore procul: vulg.

It was a true perception of affinity, which occasioned, on its first discovery, the reference of this curious fish, though with a mark of doubt, to *Tetragonurus*, Risso; only that, owing in great measure to the position of this genus among the Grey Mulletts (*Mugilidæ*) in the Règne Animal, far from its natural allies, the nature or degree of this affinity was not correctly estimated, or positively ascertained not to be generic, but

to consist in certain characters possessed in common with *Tetragonurus*, and which are truly, as, indeed, it was remarked at the time, Scombridal. This led, however, to a recognition subsequently of the proper situation of both fishes near *Thyrsites*, Cuv., and of their relative generic differences: for the peculiar structure of the skin seemed to demand the proposal of a third genus, *Aplurus*, distinct from both *Thyrsites* and *Tetragonurus*, for the reception of my former *Tetragonurus? simplex*. And though more recently, through inattention to the carinate abdomen, I was led to abandon this view, and to propose its union with *Thyrsites*, Cuv., by the name of *Thyrsites acanthoderma*, fuller consideration of the value of this character in its combination here with that of the peculiar structure of the skin, makes me revert to my earlier opinion, and retain *Aplurus* as a genus properly distinguished from *Thyrsites*, Cuv.

The Prince of Musignano, taking the same view, has in the meantime, I am informed by Miss Young, published an admirable figure of the fish in his *Fauna Italica*, under the name of *Ruvettus pretiosus*: which, although unaccompanied with the descriptive characters, she recognised immediately. I regret my inability to refer with more precision to this valuable and important work. This would appear also to be the fish from Teneriffe, alluded to by M. Valenciennes in the Preface to the Tenth Volume of the *Histoire des Poissons* as the “Rovetto (*Ruvettus acanthoderma*)” of the Mediterranean. The name Eseolar occurs, moreover, in a list of Teneriffe fishes by Mr. Diston, a resident and highly intelligent observer in that island. It is found again in several passages of the *Historia Insulana*,\* indicating the principal fishes of the Azores.

Although this fish has thus been evidently taken in the Mediterranean, it would appear to be in that sea but a rare and casual visitor: for it has escaped the notice not only of the older naturalists of the Sixteenth Century, but of Risso, Rafinesque, Laroche, and many others, who have recently so diligently laboured in this field. In Madeira, on the other hand, it is a common well-known species; which, if less abundant at any season than many other fishes, is yet altogether absent from the market long at none. Its capture is, however, so far dependent on the season, that being taken only in deep water, and at a considerable distance from the shore, it is not caught except in fine and steady weather. It is taken with an ordinary bait, at a depth (the fishermen affirm) of from twelve to fourteen *linhas*†; living habitually near the bottom, in company with the Cherne (*Polyprion cernium*, Val.), Coelho (*Prometheus atlanticus*), &c. It is sold in the market in pieces or slices by the pound; and the tail end is the most esteemed. Large fishes are said to weigh from twenty to thirty pounds, measuring about five feet in length.

\* *Historia Insulana das Ilhas*, pelo Padre Antonio Cordeyro; Folº. Lisboa, 1717.

† Each *linha*, or line, is from twenty-five to thirty fathoms (*braças*) long.

The flesh when cooked is delicately white, and flaky; but soft and insipid: and both before and after it is dressed, abounds, as if it had been steeped, in a pure limpid oil, which is not, however, at all rank or strong in taste. On this account, and from the unsightly colour of its skin, and general coarseness, it is but rarely seen at English tables: and, eaten incautiously, it is moreover said to cause speedy diarrhœa. It may, however, certainly be eaten moderately with impunity: and the effect in question is sometimes ascribed to a peculiar oiliness or richness in the bones. Dogs are, indeed, affected violently for some time, apparently by feeding chiefly on the bones and skin: but in any case the effect seems merely that of a strong dose of oil; being unaccompanied with any other symptoms.

The Portuguese name, *Escolar*, or *Chicolar*, seems, in allusion to this property, to be corrupted or derived from *assacolar*, *açacolar*, or *açicolar*, a word of Spanish origin, which signifies to scour or burnish; and particularly gun-barrels or weapons; for though disguised to the eye by the usual spelling, it is scarcely so at all in pronunciation. The more obvious supposition of identity between the name *Escolar* and the common Portuguese word signifying a scholar or student, fails altogether to explain the origin or reason of its application to the present fish. But taken in the sense of *Scour-fish*, according to the etymology proposed, there may be found in the properties above described, and in the file or sand-paper-like roughness of the skin, at least a plausible solution of the matter.

The generic name *Aplurus*, Plain-tail, is composed of *ἀπλοῦς*, plain or simple, and *οὔσα*, a tail; in contradistinction to *Tetragonurus*, Square-tail. There is, indeed, a peculiar general plainness or simplicity, both of form and colour, in this fish; contrasting strongly with the elaborate details of structure, and the gaudy hues of the *Scorpenidæ*. This is, however, strictly in accordance with its natural alliance to the Mackerel-tribe (*Scombridæ*); of which it is a genuine representative.

Shape oblong, compressed throughout, not much attenuated towards the tail, and of nearly equal depth from the eyes to the origin of the second dorsal or the anal fin; but deepest at the nape or shoulders, where the depth is one sixth part of the whole length: the thickness is also greatest from the eyes to the same part, and equals half the depth. From the origin of the second dorsal and the anal fins the lines of the back and belly slightly converge in an equal degree: but the fleshy base of the tail is not slender, but thickish and subcylindric, and its depth is one fourth part of the depth at the shoulders. It also retains more or less of compression, being scarcely so thick as deep; and it is perfectly simple, without any lateral keel or crests. The ventral line from the ventral fins to the vent, which is situated close before the anal fin, is sharp or carinate, and irregularly and obsoletely serrulate.

The head is large, remarkably compact, plain, and unarmed, with flat and even sides; yet with a heavy and clumsy look, at least compared with *Prometheus*,



from the thickness of the short muzzle, and great breadth and strength of the lower jaw. Its length is about one fourth of that of the whole fish, exceeding considerably the depth. The eyes are round and large, their diameter equalling one fifth of the length of the head. The margins of their orbits, which are quite plain and flat, are formed by a sharp simple edge of the hard skin, not of bone. They are placed a little below the outline of the head above, which descends with a very gradual and equal curve from the origin of the dorsal fin to the tip of the muzzle. The top of the head between the eyes is very broad, flat, and even: the space across, measuring from eye to eye, equalling nearly a diameter and a half of the eye. The muzzle or upper jaw extends about once and a half its own diameter before the eye: the lower jaw is rather longer, and still more broad or thick and clumsy: both with rather broad flat lips. The anterior nostril is a small round simple orifice, half way between the eye and tip of the upper jaw: the hinder is a mere vertical or lunate slit, opening only as the skin grows dry, nearer the eye.

Mouth and gape enormous: the latter descending obliquely as far back as beneath the middle of the eye, where it is overlapped by the narrow exposed ends of the maxillaries. The teeth are strong, but not nearly so long or large in proportion to the size of the fish as in *Prometheus* or *Thyrstites*: and considerably larger on the edges of the lower than of the upper jaw. Each jaw is furnished all round the edges or intermaxillaries with a row of nearly equal subrecurved and sharp teeth, growing somewhat two and two together towards the front, particularly in the upper jaw: but for the most part, and especially in full-sized fishes, pretty regularly and distinctly placed. Of these the upper jaw has from fifty to sixty; the lower about forty. Close behind these in the upper jaw, but nearly at its tip, and growing out of the intermaxillaries where they dilate to form their symphysis, is a group of from three to five, but often of two pair of larger teeth, set one behind the other along the edges of the symphysis; those of the hinder pair being the largest, and further apart laterally from each other. At some distance behind this group, there is a second group of generally three, but sometimes only two, much smaller teeth, more slender and recurved, placed in a lunate transverse line: these are belonging to the vomer. And again, beginning a little behind the outermost of these, the palatinal teeth extend backwards in a single line or row of from fifteen to twenty small but distinct and equal slender close-set equidistant recurved teeth, the size of those round the edges of the upper jaw, or rather smaller than the vomerine teeth. The tongue is large, free, prominent, and flat in front; and like the gullet perfectly smooth and even: the latter being merely furnished with the usual pharyngeal plates, which are, however, armed with strong thick-set recurved teeth.

The opercle, preopercle, and interopercle are perfectly plain, flat, and unarmed: with the edges quite entire. There is no trace externally of the humeral or super-scapular bones: but the whole shoulder is like the rest of the head, singularly plain and simple. The branchial opening is enormous: but the branchial membrane, which is seven-rayed, is narrow, and does not appear externally. Its rays are somewhat weak or slender.

The first dorsal fin begins forward on the nape, in a line above the hinder edge or point of the opercle; and ends opposite the vent; extending thus in length a distance equal to one third the whole length of the fish. It is remarkably low, and even, or of nearly equal height throughout, which in no part exceeds one fourth or one fifth part of the depth of the body below it. The rays are thus, except the two first and two or three last, nearly equal: the last of all being almost prostrate and buried in the skin; the whole being seated in a groove. All the rays are decidedly spinose, but weak and flexible, or scarcely pungent. They are striate longitudinally: but the whole fin is otherwise quite smooth.

The second dorsal fin begins about two thirds the distance from the tip of the muzzle to the root of the caudal fin, immediately behind the termination of the first, with which it is quite unconnected. It is triangular and high in front, exceeding in elevation half the depth of the body below it at this part, but short in extent, and only reaching half way from its beginning to the origin of the caudal fin. Its first three or four rays are simple, the first branched ray or two being also the longest. Its last ray is a little remote from the rest, elongated, and only partially connected by the web to the preceding; thus assuming somewhat of the aspect of a spurious finlet. This latter character is, however, completely that of a pair of rays placed further back, at one third, or nearly half the distance between this last partly detached ray and the root of the caudal fin. These two are completely detached and remote from the rest, but connected perfectly together by a web. They are twice as long as the last semi-detached ray of the second dorsal fin.

The anal fin commences opposite the origin of, and corresponds precisely in all other respects with, the second dorsal. It has the hinder two or three rays partially detached, and succeeded at some distance by a spurious finlet composed of two longer rays completely webbed together, opposite the spurious finlet of the dorsal line.

The front rays of both these fins are close set, obscure, and difficult to count: the fins are indeed altogether somewhat thick and coriaceous, as in the Tunnies or the Swordfish.

Pectoral fins triangular or ovate, rather small, their length being only from one eighth to one ninth of the whole length of the fish. The two first rays are simple. All the rays are broad and rough externally in front of each, having a somewhat coarse and rude appearance. The inside of the fin is altogether smooth.

The ventral fins are subequilaterally triangular, much smaller than the pectorals, their first ray placed immediately beneath the last ray of the same. They are situate close together on the belly, and fold back into a slight groove or hollow, running a little way back from their fore axil on each side of the body, a little above the ventral keel. Their length is only about one fifteenth of the whole length, or little more than half that of the pectoral fins. Their spine, although not pungent, is very strong, and grooved or striated longitudinally like the spines in *Beryx*: and their last ray is connected altogether to the body by a web. Their rays are rough in front on the outside of the fin, like those of the pectoral fins. They are altogether smooth inside.

The caudal fin is very large, forked, and powerful: the lobes are broad, and the upper is conspicuously larger and longer than the lower.

The structure of the skin is highly curious. To the naked eye it appears perfectly scaleless, but with a scurfy or branny look: and to the touch it is excessively harsh, rough, rude, and echinate or prickly when the finger is drawn towards the head, and has a hard stiff feel. The only smooth parts are the top of the head and muzzle, except a little space or band above each eye, which is rough, like the lips, the maxillaries, and the lower jaw. The tip however of both jaws, the fore-corner of each eye, and the space between the fore and hind nostril are smooth. Examined more closely, the whole remainder of the head and body, except the fins, is found to be thickly covered with minute and inconspicuous closely adherent or even partly imbedded cycloid scales, which are simple, round, oval, or elliptic, entire, and finely striated concentrically like the lines at the ends of the fingers: these are very thin and soft or membranous, and appear crowded and confusedly placed, without regular imbricated arrangement, giving a general furfuraeous aspect to the whole skin. But besides these, and at regular distinct intervals, arranged quincuncially in rows, the whole skin is armed with series of sharp, glassy, adpressed, forked, or double points or prickles, of which the structure is

very complicated and peculiar, presenting some analogy to the spines with their two or three-forked roots of the Diodons. Externally nothing appears but from two to four rather strong firm-fixed, short glassy points directed backwards like a fork, causing the peculiar harsh roughness of the skin, and rising from amongst the almost invisible small proper scales. Extracted from the skin, which can only be done by boiling or maceration, they are found to be fixed by means of a widely two or three-forked root, the branches or forks of which extend deeply forwards obliquely into the skin, lying almost horizontally, and nearly in the same plane with the outward part, between its coats, and crossing or interlacing with the roots of the prickles immediately adjoining them in a reticulated manner. These forks or branches of the root are much longer than the externally projecting fork, and are themselves most curiously connected together by very fine and slender flexible but bony irregularly anastomosing or cancellated complicated branches and cross-ribs. One of these prickles isolated, with its root, may be described as resembling the letter X, with the lower forks or roots however much produced: and *in situ* it is buried in the skin up to the crossing or hour-glass-like constriction in the middle. The root, however, in the larger prickles on the sides of the body is generally three-forked.

The skin, upon dissection, proves much thinner and easier to cut than could be judged from its hard or harsh feel to the touch: and when boiled is easily separable from the flesh.

The lateral line, on removal of the skin, is found to extend in a straight and nearly central course along the sides, commencing from the top of the opercle: and the flesh of which it is composed towards the tail is dark brown when boiled, and softer than the rest. Except towards the tail, where it is more or less slightly tumid like a wheal or varix, its situation outwardly is only indicated to the eye by a slight change in the direction of the longitudinal rows or lines of the prickles of the skin; which once observed is sufficiently obvious, though it may not strike the attention until pointed out. Those below it on the flanks and belly have a slightly oblique direction upwards; whilst those above it have a straight one horizontally.

The fins are all, with the exception of the first dorsal, and the inside of the pectoral and ventral, strongly shagreened or rough.

The colour of the whole fish is an uniform dusky mulberry-brown, or coffee colour, with a purplish or vinous tinge; darker upon the head and back, somewhat paler, and sometimes so in irregular patches, clouds, or blotches, towards the belly. The fins are darker and blackish towards their tips. The mouth is dusky and purplish inside, varied with pale or whitish: the tongue black. Iris pearly grey or silvery-iridescent, whitish, clouded with dusky. Pupil green-opaline.

In the dissection of two male individuals and one female, the stomach was found to be long, slender, and cylindric, reaching nearly to the vent. The cæca were from eleven to fourteen in number, large and long, of nearly equal size and length, coadnate by means of cellular tissue into a thick palmate fascicle or bundle, partly enveloped by and adnate to the liver, which was pale and large. The gall-bladder was also enveloped by the liver, very large, and of a deep green colour. The intestine was also very large or thick, and perfectly simple, or proceeding straight from the pylorus without any fold or volution to the vent. There is no air-bladder. The ovaria in the female individual (captured in June) were very long, distinct, cylindric, tumid, and vascular; but filled only with a grumose jelly.

The first of the sixteen abdominal vertebræ is very short; a mere ring: the last five or six are furnished with short, simple apophyses beneath, forming an arch, notched at the top, and giving off two short ribs from the notch. The first

caudal vertebra has the top of the arch simple, and gives off only a single compressed recurved swordlike lamina. The vertebræ are all, except the first, of nearly equal length; and both the upper and lower caudal single apophyses are short and feeble.

The top of the skull is very flat; the interparietal crest being remarkably low, and scarcely higher than the lateral crests. All the bones are rather soft and fragile, readily splitting longitudinally.

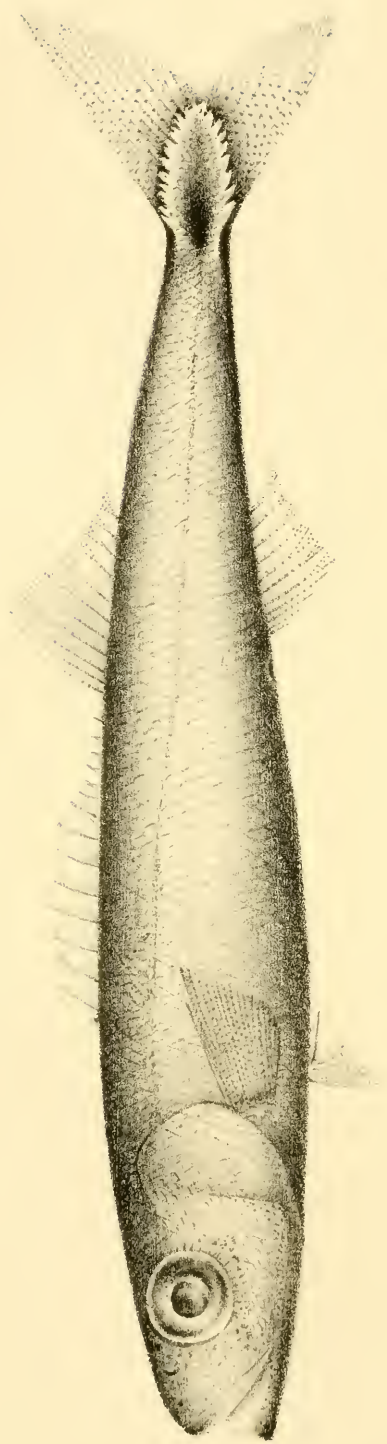
The female fish above alluded to, measuring three feet and one inch in length, weighed nine pounds and half an ounce.

The figure is reduced from one of a male example, which measured three feet four inches in length, and six inches and a half in depth. The left-hand figure above the fish represents four of the small crowded scales; the right-hand figure, the same number of the prickles with their roots, separated by maceration from the skin, but placed in their relative natural position: both these figures are considerably magnified. The middle figure of the three is a view of the under surface of a portion of the skin, in its natural state and size. The white forked parts are the roots of the prickles.









## TAB. XIX.

## TETRAGONURUS ATLANTICUS, NOB.

*Escolar de natura.*

THE SQUARE-TAIL, OR SEA RAVEN.

## CHAR. GEN.

Corpus subelongatum, fusiforme, subcylindricum, capiteque squamosum; postice tetragonum, utrinque bicarinatum.

Caput tetragonum, simplex, inerme. Rostrum breve, truncatum; maxillis antice emarginatis; inferiore lateribus s. parietibus valde elevatis, pyxidatim intra superiorem claudente. Operculum et præoperculum inermia, plana, squamosa. Dentes pectinato-uniseriati, minuti, posterioribus longioribus; palatinis uniseriatis, minutis: vomerinis paucis.

Pinnæ dorsales duæ; antica angusta, longiore; secunda brevi, triangulari, antice elevata: pinna anali secundæ dorsali similima. Pinnæ ventrales parvæ normales, subabdominales. Pinna caudalis furcata. Membrana branchiostega quinquerediata.

*Obs.*—Squamæ magnæ, arctissime adnatæ, concinniter spiraliter dispositæ, duræ, striatæ, pectinatæ, ciliatæ. Carinæ caudales breves, cristiformes, lacerato-serratæ. Pinnulæ spuria nullæ. Abdomen ecarinatum.

Pisces regionis temperatæ, oceanici, rarissimi, solitarii, erratici, minores, unicolores, fusco-nigricantes: *Thyrssiti*, *Promethæi*, *Apluri*, &c., affines; forma, orisque caudæque structura, dentibus, ac squamis insignes.

## CHAR. SPEC.

T. capite subproducto: corpore subcylindrico vix compresso: oculis maximis.

1<sup>ma</sup> D. 15; 2<sup>da</sup> D. 11; A. 11; P. 16; V. 1 + 5; C.  $\frac{7 + \text{VIII.}}{7 + \text{VII.}}$

M. B. 5; Sq. lin. lat. 90; Vertæ.

*T. atlanticus*, Suppl. Mad. Fish. in Proceed. Zool. Soc. 1839, p. 79.

*Longit.* =  $9\frac{1}{4}$  poll. =  $7\frac{1}{2}$  × alt.

*Tempus*, æstate.

*Locus*, in profundis: rariss.

IN the work of Rondelet, so early as the year 1554, we find at page 423, the first record of a fish allied generically, possibly specifically, to the subject of this chapter; accompanied by a figure, rude indeed, yet not entirely devoid of character. This figure is described to have been taken from an example communicated by an individual at Pisa named Portius, of eminent acquirements and liberality: and a remark on its excessive rarity is prefaced by the statement, “undis nostris incognitus est.” This author notices its resemblance in the aspect of the body to the Grey

Mullets (*Mugiles*): and adds that on account of its uniform blackness, and the black longitudinal lines from the gill-openings to the tail-fin, which, according to MM. Cuvier and Valenciennes, are observable in their dried specimens, he has called it *Mugil niger*. In this idea he was followed by Aldrovandi; who, according to MM. Cuvier and Valenciennes, for I have not access to his work, figures the same fish under the name of *Corvus niloticus*, supposing his example to have come from Egypt. His representation is described by MM. Cuvier and Valenciennes to be much superior to that of the Provençal Ichthyologist.

The rarity of this most curious fish may be collected from the fact, that from this latter period to the beginning of the present century, an interval of two hundred years, it had entirely escaped fresh observation: and was perhaps on this account wholly neglected by Linnæus, and the system-framers of the Eighteenth Century, though Willughby\* had given both an abstract of Rondelet's account, and a copy of his figure. It is singular that its rediscovery, after so long an interval, should have been made in that very country to which its first observer had remarked it was unknown; and by his countryman. In 1810 Risso, the well-known Ichthyologist of Nice, again supplied a brief but original description; and established it as a genus under the name of *Tetragonurus Cuvieri*. And in his *Histoire Naturelle*, he has subsequently raised this genus to the rank of a Family (Les Tetragonurides), which he places in immediate proximity to his *Mugilidæ*. MM. Cuvier and Valenciennes, describing it again in 1836 in the eleventh volume of their *Histoire*, with their accustomed accuracy of detail, have placed it also, as it had been previously placed by Cuvier in the *Règne Animal*, in a separate chapter at the end of the *Mugilidæ*.

Five or six examples only seem to have occurred of this fish, besides the two described by Rondelet and Aldrovandi: and these were taken at Nice, Genoa, and Toulon. "Another proof of its rarity in the Mediterranean," add MM. Cuvier and Valenciennes, "is, that it is neither mentioned in the works of Rafinesque and of the Prince of Musignano, nor makes part of the collections formed by M. Savigny." At Nice its common name appears to be *Courpata*, or the Raven.

It was, therefore, with peculiar satisfaction that I recognised at once in a fish brought to me, in June 1838, a true example of a genus, which, from the mere description in the *Règne Animal*, I previously had so little understood as to refer to it, though not without a mark of hesitation, a fish rather referrible to *Thyrsites*, Cuvier; namely, *Aplurus simplex*, supra t. 18. An approach, however, to the right position in the system of the true *Tetragonurus* was indicated by this very error: for the Madeiran fishermen, by calling it a kind of *Escolar*, appear to have a more just notion of its true affinity than the above-cited Ich-

\* Ichth. p. 276. t. R. 4. f. 4.

thyologists. The close alliance naturally of *Tetragonurus* with the Scombridal genera *Thyrscites*, or *Aplurus* (Escolar), may be inferred both from its being called vernacularly *Escolar de natura*, and from the true Scombridal *Escolar* having, though erroneously, been supposed to belong to the same genus.

Indeed there seems little either of external character or inward structure to warrant the arrangement of this fish amongst the *Mugilidæ*. These have few *cæca*, *Tetragonurus* having many: in the true Grey Mulletts the ascending branch of the stomach dilates into a sort of gizzard; in *Tetragonurus* it is simple: they have few vertebrae; *Tetragonurus* has many: they have minute and feeble or setaceous teeth; it has them distinct and bony: they have the palatines and vomer normally unarmed; it has them armed: they have smooth and apparently entire scales\*; it has them rough and pectinato-ciliate. In *Tetragonurus* the form of the fins, especially of the two dorsal fins, and the nature of their rays differ remarkably from the usual character of these parts in the *Mugilidæ*; and the anatomical structure of the pharynx, mouth, and teeth, has nothing whatever of the peculiar organization which characterizes so singularly the Grey Mulletts. The pseudo-abdominal or backward position of the ventral a little behind the root of the pectoral fins, is a very trifling, fallacious character† when resting as here, and in many other Acanthopterygious fishes,‡ on mere external appearances: and if insufficient for a ground of association with the Grey Mulletts, it is absolutely of no value whatever as a mark to separate *Tetragonurus* from the *Scombridæ*, Cuv.; for the ventral fins, or their rudiments, in a crowd of these,§ are equally behind the pectoral, and are vastly more so in *Nota-*

\* A high power of the microscope shows, indeed, that the edges of their laminae in *Mugil* are finely crenulate: in which, if not *sui generis*, they may be perhaps considered to approach rather to the ctenoid, than to be of the true cycloid structure. But if this serve not for a caution against employing too absolutely the intimate formation of the scales in founding or defining the main ichthine divisions, it shows at least the liability to practical uncertainty attendant on these characters. In the *Scombridæ*, normally the scales are truly cycloid: in the *Mugilidæ*, they are only so apparently, or ambiguously: in *Tetragonurus*, otherwise Scombridal, they are eminently and distinctly ctenoid. Thus the character in which *Tetragonurus* approaches, according to this theory, nearest to the *Mugilidæ*, is the very point in which it most appears, except on microscopical investigation, to differ from them. And even after appeal to the microscope, it might truly be affirmed that there is no stronger discrepancy between the scale of a true Scombridal fish and of a *Mugil*, than between one of the latter and of a *Tetragonurus*. This genus may, however, be considered as in several respects connecting *Mugilidæ* with *Scombridæ*.

† See Cuv. and Val. Hist. iii. 67; *ib.* xi. 195.—The ventral fins in *Tetragonurus* are not truly abdominal or unconnected with the bones of the shoulder, as in the Abdominal Malacopterygians, or the Acanthopterygian *Sphyrænilæ*.

‡ The ventral fins are quite as abdominal, apparently, in the typically thoracic genus *Percæ*, as in *Tetragonurus* and the Grey Mulletts.

§ E. g. *Lampris*, *Scomber*, *Thyrscites*, *Gempylus* proper, *Lepidopus*, *Aplurus*, some species of *Lichia*, *Caranx*, &c.



*canthus* and *Alepisaurus*.\* The “slenderness and concealment of the maxillary, and thickness of the upper lip” (Cuv. and Val. Hist. xi. 173) are equally inconsequential; or, when compared with certain genuine *Scombridæ*, absolutely null as differential characters, however they may have aided in suggesting to the older Ichthyologists the approximation above mentioned. In short, the relation of *Tetragonurus* with the *Mugilidæ* is at most one only of transition, if indeed one of more than mere analogy: whilst with *Scombridæ*, Cuv., through *Aplurus* and *Thyrsites*, it agrees no less in all essential points of structure both internal and external, than it does in habit, form, and colouring.

To speak more definitely, *Tetragonurus* is Thyrsitoideo-Scombridal, or allied to the Thyrsitoid Scombridæ, in its elongated form, large branchial opening, mouth, and gape; in its uniformity of colour, and large opaline dark eye; in the number of accessory rays above and beneath, and the lateral keels, at the root of the caudal fin; in the position, shape, and character of the dorsal and anal fins; in the whale-bone-like nature and strongly barred or knuckled structure of the soft rays in all the fins; and lastly in the long, simple stomach, numerous *vertebræ* and *caca*. The teeth also in their shape, and in their presence on the palatines and vomer, agree, like the anatomy, precisely with *Thyrsites*.

Thus, on this cumulative evidence, and with the exception of the ctenoid scales, *Tetragonurus* proves, as from the discovery of the cognate *Aplurus* I suspected† long before seeing (as it appears) a genuine species, at least as properly Scombridal as *Thyrsites*, Cuv.: and since *Aplurus*, scarcely differing generically from *Thyrsites*, offers in the dermal characters, already so remarkable, an instance of anomaly amongst the *Scombridæ*, there seems no occasion, after Risso, to consider it the type of a peculiar family, “les Tetragonurides,” Risso.

The only individual of the Madeiran fish which has occurred, was taken by a fisherman of Camera de Lobos, a village three or four miles to the westward of Funchal, on the 28th of June 1838: who assured me that he had caught it swimming on the surface, with his hand; an account which, corroborated by the absence of all injury from the hook about the mouth, better corresponds with M. Risso’s statement of the feeble swimming powers (“faible natation”) of his fish, than with M. Laurillard’s of its activity (“vivacité de ses mouvements”).‡ Since all about its history and structure indicate, however, a pelagic fish, whilst nothing either in its organisation or affinities would denote departure from the usual habits of its tribe, it is extremely probable that the alleged cir-

\* The affinities of both these genera are doubtful: yet the former is, like *Lampris*, included in *Scombridæ* by MM. Cuvier and Valenciennes: which is sufficient for the present argument.

† See Proceed. Zool. Soc. 1833, 1, 143.

‡ Cuv. and Val. Hist. xi. 184.

cumstances under which the Madeiran fish was captured, might be owing to mere accidental weakness and disease. The nature of its food in MM. Cuvier and Risso's fish, proves that it takes at least its prey upon or near the surface.

Nothing is further known about the habits, qualities, or breeding-season of the Madeiran fish. Risso relates of that of the Mediterranean, that it "lives solitary and single at great depths, which it prefers; only approaching the shore in summer (June, September), when it is in spawn." "Its flesh," he adds, "though white and tender, is injurious at this season, because the fish feeds upon *Stephanomia* and other floating *Radiata* (Jelly-fish), which, from their extreme causticity and acrid properties, are no doubt the cause of this peculiar quality."\* From MM. Cuvier and Valenciennes' fuller account, this author seems to have been adventurous enough to test himself, and more than once, its dangerous properties; which produced in him all the usual symptoms of an acrid poison: namely, a burning heat in the throat and tonsils, nausea, vomiting, sharp pains in the bowels, ending with tenesmus, and with lassitude in all the limbs during two days. They confirm this Ichthyologist's account of the food of the *Tetragonurus*; having found the stomach, in the example which they describe and figure, and which they state to have been captured in the month of February, filled with the remains of such *Acalephæ*; and they agree with him in ascribing to this poisonous food of the fish, the deleterious effects produced upon the human system by its flesh.†

The question of the specific identity or difference of the Madeiran and Mediterranean fishes will be best entertained after a full description of the former.

This fish in shape is elongate and subfusiform; and is characterized no less to the eye by a remarkable neatness and general plumpness or roundness of form throughout, than by a peculiar flexibility combined with fulness and compactness to the touch. The regularity and distinctly spiral distribution of the scales, together with the absence of all spines or prominences, contribute to the general impression on the eye of plainness, elegance, and symmetry. The head is somewhat compressed, but the body scarcely so at all, and that only from the shoulders to the vent. Behind this it is quite cylindric, and as broad as high; becoming however towards the tail distinctly square or isotetrahedral, with the angles obsolete, but the upper (dorsal) and under (ventral) sides especially flattened. At the origin of the caudal fin these four equidistant angles rise suddenly into four

\* Riss. Hist. iii. 382, 383.

† The case of the Hedgehog feeding with impunity upon Cantharides, of which a "single insect is sufficient rapidly to kill a good-sized dog," does not seem to be much in point. It only is an instance of a common well-known fact, exemplified in the case of the Brazilian hogs feeding on the poisonous wild Cassava-roots. The curious phenomenon is not that the fish should find its food in what is poisonous to man, but that its flesh should be *in this way* rendered deleterious. Is this last the case with a Cantharides-fed Hedgehog? It is not so with the Cassava-root-fed hogs.

short elevated lacerato-serrate crests or ridges of produced toothed scales, forming on each side the root of the tail-fin, in a side-view, a pair of distinct, abrupt, and high but short keels converging backwards, and meeting in the middle of the fork of the tail-fin. The dorsal and ventral outlines are similar and equal; and the curvature of each is very trifling throughout; the truncature of the muzzle and the depth at the root of the tail-fin not requiring much approximation or convergence of the extremities of these lines. The top of the back towards the middle of the body is broad but rounded, becoming flattened towards the head as well as the tail. The belly underneath is rounded: with a fine closed groove, or line, like a cut with a sharp knife, formed by the meeting of the scales of each side the body, and extending from the ventral fins to the vent. Towards the tail the ventral face is flat, or even slightly hollow: with a similar *raphe* or groove from the hinder end of the anal fin, becoming obsolete towards the origin of the lower lobe of the caudal fin.

The greatest depth is from the nape or shoulders to the tips of the pectoral fins; scarcely diminishing from thence to the origin of the second dorsal or the anal fins: and it is contained from seven to nearly seven and a half times ( $7\frac{2}{5}$ ) in the whole length of the fish. The thickness, which is greatest at the same part, and decreases also uniformly and proportionately with the depth, is three fourths of the depth. The thickness at the origin of the caudal keels or fin is however only one sixth less than the depth at the same place, and is contained nearly thirty times ( $29\frac{3}{5}$ ) in the whole length. The depth at the same point is contained nearly twenty-five times ( $24\frac{2}{3}$ ) in the same. The length of the caudal crests or keels themselves equals the diameter of the eyes: their height being one fifth of their length.

The length of the head is contained little more than four times ( $4\frac{6}{17}$  or nearly  $4\frac{1}{3}$ ) in the same: or exactly four times in the length from the tip of the muzzle to the middle of the fork of the caudal fin. It is oblong and four-sided, but deeper than broad; the sides or cheeks are flat and plain like the top, which is also extremely broad between the eyes; the breadth here nearly equalling their diameter, which is itself contained between fifteen and sixteen times in the whole length, or a little more than three and a half times ( $3\frac{9}{14}$ ) in the length of the head. Hence the eye is very large, occupying considerably more than half the depth of the head; and though placed a good deal above the middle of the sides, the upper edge of the orbit falls quite within and indeed a little below the profile. It is almost perfectly round, with the edges or orbits peculiarly flat and plain: their hinder half however being crenate, wrinkled, or radiato-striate, like the edge of a sphinctral orifice: reminding one of *Pompilus Rondeletii*, Will.

The muzzle is deep, short, and obtuse or truncate; its length before the eye equalling the diameter of the same. The jaws are of equal length: the upper lip is broad and smooth: the maxillary is externally indistinguishable from the inter-maxillary; and when the mouth is closed, it is in great measure concealed beneath the broad, entire, even-edged anterior suborbitary: its end not appearing at the corners of the commissure or gape. There is no lower lip, at least externally. The anterior nostril is a moderately large, round, simple orifice, situate about one quarter of the distance along an oblique line from the tip of the upper jaw to the upper edge of the eye or orbit: the hinder is a plain lunate slit, a little behind the fore-nostril, along the same line.

The mouth is large and broad, but the gape is moderate, not extending back beyond the fore edge of the eye: and though the lower jaw is sufficiently extensible, yet the excessive height of its sides quite countervails its mobility, and must prevent the grasp or seizure of any large unyielding substance.

When closed, nothing appears about the mouth unusual or peculiar: but upon

opening it, the lower jaw presents a most remarkable appearance from the extraordinary elevation of its sides, resembling enormously high gums,\* and shutting into or within the upper jaw, like the high-raised sides of a box, or the arched ends of a trunk with a round top, within its lid. Each side in fact forms a thin but high and convex arch within the mouth; highest in the middle, and from thence descending gradually towards the corners of the mouth, but falling much more rapidly and steeply forwards towards the front, which is deeply notched: the greatest height of these internal gum-like sides or walls in their middle, rather exceeding half the length of the jaw from its tip to the canthus of the mouth. Thus the lower jaw resembles the hollow square stern of a ship or boat, with steep high sides. All this vertical internal part or wall is smooth and shining: below, from the canthus to the tip, there runs a narrow horizontal band of imperfect scales, rough like shagreen; and this is all that appears externally of the lower jaw when the mouth is closed. The notch in front is very deep; the walls or gums being here cut down quite to the rough external band. The tip however of the jaw below it is still broad and truncate, flat and smooth. The upper jaw exhibits none of this peculiarity of structure. It is however retuse or slightly notched in front, and the teeth, as in the lower, are divided into two sets or divisions, by a little gap in front.

The teeth in the upper jaw are in a single row, divided as above explained into two sets of from forty to fifty on each side, in all from eighty to a hundred. They are minute, conic, close-set, or regular, and finely pectinate: the front ones more produced, and sharp or conico-acuminate, and somewhat incurved; the hinder ones becoming gradually smaller. Their points project forth from a band of semi-transparent skin, which sheaths their base, through which their roots or lower parts are distinctly traceable: this resembles perfectly a true gum, only it is free, and not adnate or cohering to the roots of the teeth. The same kind of gum is found in the similarly finely pectinate-toothed Blennies. Hence the supposed analogy with the dentition of the *Mugilidae* is not real, but in appearance only.

Chevron of the *vomer* in front of the palate feebly armed or furnished with a few fine teeth: its line behind running backwards in the middle of the palate between the palatines, raised, and finely serrulate, like the palatines themselves.

The lower jaw is similarly furnished on the edges of the high-arched sides or branches with a single row of from eighty to a hundred teeth, divided into two sets of forty or fifty each, by a much deeper-cut-down notch or gap than in the upper jaw. The teeth also themselves are generally larger, and even more regularly and beautifully pectinate than in the upper. Also they are not conic, but much compressed, like little narrow lancets, with the points slightly recurved: or they may be described as narrow-oblong, parallel, and close-set, like the teeth of a comb, with the points of each cut off obliquely, but so as to present a generally even cutting edge, like that of a fine and long-toothed saw. Contrary to those of the upper jaw, they are smallest and shortest in front, increasing rapidly in length and size towards the middle or high part of the side, and scarcely again diminishing till quite at the hinder end of the jaw. Their base, as in the upper jaw, is covered by the same sort of gum or band of thin transparent skin, tightly embracing but not adhering to their lower half or base; which can be seen through it as far down as to the edge of the high-raised wall or sides of the jaw, in which their root is fixed.

The teeth in both jaws are distinctly bony, white, and glassy; and they are fixed firmly in their places; thus offering in no respect analogies of structure with the *Mugilidae*.

\* What may be called more properly the gums will be presently described.



The tongue is large, free, boat-shaped, with the sides high and raised like vertical walls, cut down abruptly in front, and with the tip obtuse: in short, a miniature model of the lower jaw. It is quite smooth; and its tip lies in a hollow between the raised points of a curious horseshoe-shaped fleshy cushion placed within the teeth at the bottom of the tip of the lower jaw, with its points or concavity directed backwards.

Nothing peculiar of structure was apparent in the pharynx, or the branchial arches at the back part of the mouth.

The preopercle is plain, unarmed, broad, and flat; its hinder edge descending straight and vertically to the lower angle, which is nearly a right angle, and on which is just discernible a faint short ridge running out to its point. This hinder edge is also finely striato-denticulate. Its lower edge lying over the narrow *interopercle* is nearly horizontal or but very slightly convex.

The opercle also is unarmed, flat and plain. It is extremely broad and large; and its hinder edge is equably and regularly rounded, forming almost the segment of a circle, and descending in a spiral curve under the throat; being without trace of angle, point, or sinuosity. The scales upon it leave merely the edge bare, which is finely and remotely striate; the striae excurrent into minute ciliate teeth or spinules. There is no skin or membranaceous border underneath or extending beyond its edge, which on the contrary is like that of the preopercle perfectly clear, and sitting peculiarly compactly and closely to the shoulder: on which there are discernible externally no traces of the humeral or scapular bones.

The gill-opening is very large, extending forward underneath the lower jaw, where the two gill-membranes of the opposite sides unite: the latter being each five-rayed. Thus there is great freedom of play afforded to the opercle. The lower edges of the interopercles meet or overlap beneath the throat. The two lowest of the five branchial rays are shagreened or rough.

The pectoral fins are placed about one third of the height up the side and very forward; the edge of the opercle touching their fore axil. They fit into a slight hollow of the side: and are rather small, their length being one ninth of that of the fish. Their shape is narrow-oblong, or obcuneate, and pointed at the tip.

The ventral fins are small, and ovate; only half the length of the pectoral, and fitting into a deep groove or hollow in the middle of the belly, in which they can lie almost concealed. Their base is a little behind that of the pectoral fins; but yet, when turned back, their tips do not reach to the level of those of the pectoral fins. Their spine is weak: the last branched ray is free.

The first dorsal fin begins rather far back, opposite the tips of the ventral fins when turned back, or at about one third of the length from the tip of the muzzle to the middle of the caudal fork: and its extent, or the length of its base, is equal to one fourth of the same length, *i. e.* to the length of the head. It is generally low, but highest towards the front, where its depth is about one fourth of that of the body beneath. Its base throughout is in a narrow groove, within which it can lie perfectly concealed. It is composed of fifteen distinctly pungent spines, which become shorter and more crowded backwards. The first is extremely short, feeble, and obscure; and placed close before the base of the second, which is only a little shorter than the nearly equal five or six succeeding spines. The rest behind become gradually stronger as well as shorter, and they are only webbed half way up: the last of all being very short, and nearly free.

The second dorsal fin begins at a very little interval behind the last spine of the first, with which it is completely unconnected. It is not seated in a groove: that which receives the first dorsal fin closing immediately behind its last short spine. It is high in front, triangular, and short; the length of its base only equaling the depth of the body beneath it, and its greatest height being two thirds of the same.



Thus a considerable space, nearly equal to the length of the head, or one fourth of that of the body, is left between its hinder end and the root of the caudal fin. It consists of eleven rays, of which the two or three first are simple; and the fourth is the longest. The last ray nearly equals half the length of the fourth. All of them are soft, distinctly barred, and very fragile; being of a substance like whalebone.

The anal fin corresponds in structure, form, and termination, precisely with the second dorsal; but begins a little backward, and is altogether lower and smaller. Its last ray is the length of the fifth or longest ray. The two first rays are simple.

Though the bases both of the second dorsal and the anal fins are not seated in a proper groove, the scales rise a little on each side. The web of these fins is however perfectly naked. The last ray of both is free behind; and not double as usual, but branched like the preceding. There are no spurious finlets behind either; but the last ray of each is a little produced or apiculate, as in most fishes.

The two dorsal fins occupy a middle space on the back, rather greater than one third of the length of the body, from the tip of the muzzle to the termination of the lateral line or point of the scaly part in the middle of the caudal forks: leaving a space before the first ray of the first dorsal fin exactly equal to that behind the last ray of the second.

The caudal fin is large and forked, with the lobes broad but rather short; the upper one being the largest. Their outer base both above and beneath is raised or convex (as is usual in *Scombridæ*) by a number of short accessory rays: and all the rays, like those of the second dorsal and the anal fins, are extremely fragile, of a whalebone-like substance, and strongly barred or knuckle-jointed, as in *Alepisaurus*. From their fragility, the points of the lobes can rarely be preserved entire. They are in length about equal to the greatest depth, or one seventh of the whole length of the fish.

The whole body, the opercles, and the cheeks are covered with a peculiar kind of hard and compact armour of large close-set scales, elegantly and beautifully disposed, like neatly-plaited braids of hair, in regular oblique subspiral rings, or arcuated lines, descending obliquely forwards from the dorsal to the ventral edges. Of these lines there are eighty-three from the origin of the lateral line on the shoulder to that of the upper of the two keels at the root of the tail-fin, beyond which they are confused and indistinct: on the opercle there are ten, and nearly the same number on the preopercle. At the root of the tail-fin and on the nape these rings or rows of scales are considerably narrower: but on the sides of the body they preserve great uniformity of size. On the caudal keels the scales rise abruptly into jagged or ragged crests: and they are continued over the whole breadth of the caudal fin in the middle of its forks to the tip of its shortest ray into a point, exactly as in *Beryx*. To this point, which is the termination of the lateral line, the two keels converge: and the scales of the fleshy part thus intercepted by them on the caudal fin are quite small and confused. They are all so firmly fixed that they can scarcely be removed without laceration; tearing off in spiral belts, and adhering strongly laterally to each other. The exposed part of all the scales is exactly rhomboid, and strongly longitudinally striate, with the edge also finely pectinato-ciliate. Examined with the compound microscope, these striæ are found to be composed of rows of distant imbricated spines or teeth; the angles between which, laterally, are not acute as usual, but widely arched or rounded. The outer edge of the scale is deeply pectinate or scalloped; and the whole resembles a *Pecten*, with imbricato-spinose ribs. Hence the surface is very rough, when the finger is drawn from the tail forwards: though it is peculiarly smooth, and has a silky feel to the touch, when the hand is passed in a contrary direction.

The lateral line is nearly straight; descending very gradually to the middle of

the body, which it attains at about the origin of the second dorsal fin. It is marked out by several of the middle striae of its scales being more raised or prominent, or with deeper grooves between them, than the rest.

The webs and rays of all the fins are perfectly naked or devoid of scales.

The scales extend forwards on the nape or top of the head to a line with the hinder edge of the orbit; and on the cheeks under the eye in a band to the corners of the mouth or gape: leaving a narrow space behind and underneath the eye, the angle and lower border of the preopercle, the whole interopercle, the exposed part of the lower jaw, the muzzle, and the top of the head naked apparently, but very rough as if sanded or shagreened.

Colour of the whole fish an uniform rusty or brownish black, with a slight vinous tinge and glossy silken lustre: the fins darker, and all uniform. When somewhat dry, the ciliated edges of the scales, and especially the caudal crests, appear greyish-white or glassy (hyaline). The eye is dark and subopaline. The tongue and whole inside of the mouth and gill-openings are blackish. The high-raised sides of the lower jaw, as far down only as they shut within the upper jaw, are pale brown: the gums and teeth are pale or white.

The leading points in which the Madeiran fish differs from the Mediterranean *Tetragonurus Cuvieri*, as described by MM. Cuvier and Valenciennes, Hist. xi. 176, t. 318, are the much larger eyes, and less breadth in proportion to the eyes between them at the top of the head; the body thicker at the shoulders, thinner at the base of the tail-fin; the somewhat longer head, and pectoral fins; the higher first dorsal fin; the inequality of its spines; and lastly the much greater number of the teeth in the upper jaw. The exact value of these differences will be best estimated from the following table:

<i>Tetr. Atlanticus.</i>	<i>Tetr. Cuvieri</i> , Risso.
Diameter of eyes = $\frac{\text{length of head}}{3\frac{9}{14}}$ ; or = $\frac{\text{whole length}}{15\frac{7}{8}}$ .	Diameter of eyes = $\frac{\text{length of head}}{5}$ ; or (by the figure) = $\frac{\text{whole length}}{26\frac{3}{8}}$ .
Space between eyes = nearly diameter of eyes.	Space between eyes = $1\frac{1}{2} \times$ diameter of eyes.*
Thickness of body at shoulders = $\frac{3}{4} \times$ depth	Thickness of body at shoulders = $\frac{1}{2} \times$ depth.
Do. do. at base of tail-fin = $\frac{\text{whole length}}{29\frac{3}{8}}$ .	Do. do. at base of tail-fin = $\frac{\text{whole length}}{15\frac{1}{2}}$ .
Length of head = $\frac{\text{whole length}}{4\frac{6}{17}}$ = $\frac{\text{whole length}}{4\frac{1}{3}}$ nearly.	Length of head = $\frac{\text{whole length}}{5\frac{1}{8}}$ .
Length of pectoral fins = $\frac{\text{whole length}}{9\frac{1}{4}}$ .	Length of pectoral fins by figure = $\frac{\text{whole length}}{12\frac{1}{2}}$ .
Longest (2d.—8th.) spines of dorsal = $\frac{\text{depth of body}}{3\frac{1}{8}}$ .	Longest (2d.—?) spines of dorsal = $\frac{\text{depth of body}}{7}$ .
Number of teeth in upper jaw 40 or 50 on each side.	Number of teeth in upper jaw 24 or 25 on each side.
1 <sup>st</sup> . D. 15; 2 <sup>d</sup> . D. 11; A. 11; P. 16; V. 1 + 5; C. $\frac{7 + \text{VIII}}{7 + \text{VII}}$ ; B. M. 5.	1 <sup>st</sup> . D. 15; 2 <sup>d</sup> . D. 1 + 13; A. 12; B. M. 5; Verte 36 abd. + 22 caud. = 58; Cuv. and Val. + 1 <sup>st</sup> . D. 18; 2 <sup>d</sup> . D. 1, 12; A. 1, 11; P. 16; V. 1, 5; C. 36; Risso.

\* This difference however may be only due to the greater size of the eye in the Madeiran fish.

† These authors have omitted giving the number of rays in the pectoral, ventral, and caudal fins of their fish.

The above discrepancies, it must be remembered, refer only to MM. Cuvier and Valenciennes' account of the Mediterranean fish. With Risso's brief description, as far as it goes, the Madeiran fish agrees so well, that its identity might not have appeared questionable. But it must be remarked that he omits all the proportions and comparative measurements, in which chiefly the differences consist.

MM. Cuvier and Valenciennes having furnished a complete account of the anatomy of their fish, it seemed needless to sacrifice an unique example for the purpose. According to these authors, the peritoneum in the Mediterranean fish is blackish-brown (*brun noirâtre*): the liver of a fine yellow, and divided into two equal lobes, embracing the *œsophagus* and stomach. The *œsophagus* is long and blackish, furnished within with numerous long, pointed *papillæ*, which are quite soft; not hard, as stated formerly by Cuvier in the *Règne Animal* (2<sup>e</sup>. Ed. ii. 233). The stomach is a very long conic pointed sack, extending to the extremity of the ventral cavity. Its ascending branch springs from about the middle of the cone formed by the *œsophagus* and stomach together; and here, near the *pylorus*, its parietes are somewhat thickened, without however dilating into a bulbous gizzard. The *cæca* are numerous, unequal in length, and arranged symmetrically. The intestine is rather long, making one complete revolution, and two half ones. There is no air-bladder: and the spine consists of thirty-six abdominal and twenty-two caudal vertebræ, making fifty-eight in all. The sex of the individual examined was indeterminate.

The unique example of the Madeiran fish here figured was nine inches and a quarter long. The right-hand lower figure is a three-quarter view, the size of life, of the mouth; showing more perfectly than when seen in profile the peculiar mode in which it closes, and the form of both the jaws. The lower extreme left-hand figure is a magnified fore portion of the lower jaw, to show the teeth and gums. The middle figure is the bottom or inside of the fore part of the lower jaw, with the fore part of the tongue *in situ*; its tip lying between the points of the fleshy horseshoe inside the tip of the jaw.









*T. 20 MY. 21.8 60*

## TAB. XX.

## PROMETHEUS ATLANTICUS, NOB.

*Coelho.*

## THE RABBIT-FISH.

## CHAR. GEN.

Corpus subelongatum, compressum, cum capite læve, nudum s. squamis inconspicuis, membranaceis, parvis; postice utrinque ecarinatum.

Caput elongatum, simplex, inerme. Rostrum productum, maxilla inferiore longiore, apertura branchiali rictuque vastissimis. Operculum et præoperculum inermia, plana, integerrima. Dentes compressi, ancipites, acuti; externi in utraque maxilla uniseriati; internis quibusdam antice ad apicem prælongis; palatinis uniseriatis, parvis; vomere inermi.

Pinnæ dorsales duæ, numero radiorum subæquali: antica angusta, continua, æquali, longiore; secunda brevior, triangulari, antice elevata, postice in pinnulas spurias vix secedente; pinna anali secundæ dorsali simillima. Pinnæ ventrales rudimentariæ, in adulto obsoletæ, ad stipites squamiformes redactæ. Pinna caudalis furcata. Membrana branchiostega septemradiata.

*Obs.*—Omnia *Thyrsitis*, Cuv., præter vomerem inermem, pinnas ventrales in adulto obsoletas, secundamque dorsalem in pinnulas spurias pauciores vix secedentem.

Pisces oceanici, regionis temperatæ, unicolores, voraces, edules. Dentes maximi, longiores quam in *Apluro*, Nob.

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P. Atlanticus, Syn. Mad. Fish. 181.

1<sup>ma</sup> D. 18; 2<sup>da</sup> D. 3 + 16 v. 17 + II.; A. 1 v. 2 + (2 + 14 + II.); V. I;

P. 14; C.  $\frac{3 - 6 + I. + VIII.}{4 v. 5 + I. + VII.}$

M. B. 7; Sq. lin. lat. indefinitæ. Vertæ. 20 abd. + 14 caud. = 34.

*Longit.* =  $1\frac{1}{2} - 2\frac{1}{2}$  ped. = 6 — 7 × alt.

*Tempus*, æstate.

*Locus*, in imo profundiore: vulg.

THE genus *Gempylus* was originally constituted by Cuvier in the Règne Animal for the sole reception of the *Scomber serpens* of Solander; the “*Serpens marinus compressus, lividus*” of Sloane’s Natural History of Jamaica, t. I. f. 2. Although this fish appears more properly to be a West Indian species, the individual described by Solander was taken near the Canary Islands: which renders its occurrence in Madeira by no means improbable.

In the eighth volume of the *Histoire Naturelle des Poissons*, by MM. Cuvier and Valenciennes, this genus (*Gempylus*) reappears, with the addition of the three following species: viz. *G. coluber*, Cuv. and

Val., a Tahitan fish, brought from the Pacific by MM. Garnot and Lesson; *G. Prometheus*, Cuv. and Val., a fish which, being captured by MM. Quoy and Gaimard its discoverers, near St. Helena, had been previously published by these naturalists under the generic name of *Prometheus*, in fanciful allusion to the noted captive of the neighbouring rock; and thirdly, *G. Solandri*, Cuv. and Val., founded upon the Australian *Scomber macrophthalmus*, Sol. The first of these appears, indeed, to be a genuine addition to the genus, as originally formed and typified by Cuvier. The second and third have been less happily associated with *Gempylus*; and might perhaps have been more advantageously united with *Thyrsites*, Cuv.

It is proposed therefore to restrict the genus *Gempylus* to the two species *G. serpens* and *coluber*, Cuv. and Val.; dismembering it of the heteromorphous *G. Prometheus* and *G. Solandri*, Cuv. and Val. Thus remodelled, or rather restored to its strict original Cuvierian form or acceptance, it is well distinguished from either *Thyrsites*, Cuv., or *Prometheus*, Quoy and Gaimard, by the long, thin, sword-like form of body, the unarmed palatines, the total want of ventral fins, and the many-rayed first dorsal fin, continuing far down the back; in all these points, except the second, approaching rather to *Lepidopus* of Gouan. No species of the genus thus restricted has, however, yet been taken in Madeira: although, as it was mentioned, *G. serpens* (*Scomber serpens*, Sol.) has occurred near the Canaries.

The claims, however, to generic distinction of *Prometheus*, consisting of the eliminated part of *Gempylus*, and the subject of the present chapter, are less easily adjusted. Its members are undoubtedly improperly associated with *Gempylus* as originally constituted by Cuvier: disagreeing with the genuine or typical species of that genus in the form of body, which is that of the more ordinary fishes; in the relative proportion of the first and second dorsal fins; and in the armed palatines. But from *Thyrsites* they only differ in the following far less essential points: viz. the rudimentary, or indeed in old or adult fishes, wholly obsolete condition of the ventral fins; in the fewer, scarce developed, spurious finlets; and the unarmed vomer.

The value of the first of these characters is much affected by the fact of the existence of the ventral fins in at least a partially developed state in young examples of the subject of this chapter: and that of the second is no less diminished by an evident approximation on the part of certain species of *Thyrsites* to the same formation, through *T. lepidopoides*, Cuv. and Val.

The fishes comprehended in *Prometheus*, therefore,—viz. *Gempylus Prometheus*, and *G. Solandri*, Cuv. and Val., together with the subject of this chapter, might well have been considered a mere group or section of

*Thyrsites*. But when a genus has been once proposed, and any tolerable ground remains for its retention, and that particularly in a part of Ichthyology in which both the distinctions and the correlative value of the groups are little understood, it seems, upon the whole, most prudent to make everything subservient to practical convenience, which always suffers by a change of names. The genus and the nomenclature, therefore, are adopted here of MM. Quoy and Gaimard; who have at all events done better in forming a new genus for their fish, than if they had united it with *Gempylus serpens*, Cuv.

The settlement of the specific relations of the three fishes properly belonging to the group *Prometheus*, is a point of no less difficulty than this of their generic claims. I formerly considered *Gempylus Solandri*, Cuv. and Val. (*Scomber macrophthalmus*, Sol.), to be the adult of their *G. Prometheus*; and the Madeiran fish to be the intermediate stage between the two: but both these suppositions are incapable of demonstration; and the wide difference of locality renders their distinction, *prima facie*, probable. It is better, therefore, to abstain from any such conjectural union; and, on the other hand, to await further and fuller observations both on the Australian fish of Dr. Solander, and on Messrs. Quoy and Gaimard's St. Helena kind, before attempting a specific character; furnishing, meantime, a full account of the Madeiran species, to preclude, at least, all future doubt regarding its identity and characters.

The fishermen relate that the Coelho is a very cunning wary fish, which snatches at the bait (a piece of Mackerel or other fish) and takes it with a sudden snap, cutting it often from the lines with its sharp teeth, and swimming off with it together with the hook: and hence, they add, its name *Coelho*, Rabbit. It lives habitually at the bottom, and is taken at most seasons in a depth of from one to three or four hundred fathoms. In the summer months it is generally one of the commonest and cheapest fishes in the market, where it is sold in bundles, chiefly to the Portuguese; being held in little estimation by the English, though when fried in slices, whilst quite fresh, it is rich, flaky, firm, and not unpalatable. Its flesh, when boiled, is dry, soft, and insipid: and there are then few fishes less deserving to be styled edible. Even to the eye these fishes have a lean and hungry, famished look, and their flesh or body has a peculiarly soft and flabby feel. And thus, though living at so great a depth, they require to be cooked as speedily as possible after capture.

This fish is considerably compressed throughout, slender and elongated; yet without that extreme development of these characters which gives so peculiar an aspect to the true *Gempyli* or to *Lepidopus*: that is, it is neither serpentiform nor swordblade-like; nor is it carinated either on the back or belly. The greatest depth is at about the middle of the body, from the tip of the muzzle to the base of the caudal fin, and ranges from near one seventh to one sixth of the whole

length; becoming for the most part proportionately greater as the fish grows larger, but varying somewhat according to the condition of the individual examined in respect to repletion or pregnancy: the abdominal region being peculiarly flaccid and extensible. Hence the less proportionate depth (one seventh and a half, or, by the figure, one seventh of the whole length) in *G. Prometheus*, Cuv. and Val., than that which usually is found in the full-grown Madeiran fish, may fairly be ascribed to the small size (ten inches long) of their individual, and to the decomposed condition of its viscera. It is also worth remarking, that the adult Madeiran fish, from one foot and a half to two feet and a half long, is precisely intermediate in the relative proportions of its depth and length between MM. Cuvier and Valenciennes' *G. Prometheus* of ten inches, and their *G. Solandri* of three feet long, in which the depth is said to be one fifth and a third of the whole length.\*

The greatest thickness of the Madeiran fish is close behind the eyes below the nape; and is contained from two to sometimes nearly three times in the greatest depth. The length of the head is about one fourth of the whole length; and the diameter of the large eye is from one fourth and a half to one fourth of the length of the head. In a young example only five inches and three eighths long, the eye was between one fifth and one sixth of the length of the head: in MM. Cuvier and Valenciennes' *G. Prometheus* of ten inches, it was one fourth of the same. The eyes are rather prominent; but the upper edge of their orbit does not rise above the outline of the profile: they occupy more than half the depth of the head. The space between them is broad, nearly equaling the diameter of the eye, and remarkably flat like the top of the muzzle; with a wide shallow hollow or depression, running up into a point towards the nape. Head long and pointed: the upper and lower lines of the profile converging equally and evenly, except a slight elevation over the eye, from the origin of the dorsal and ventral fins to the tip of the elongated muzzle, which extends one diameter and a half before the eye. The anterior nostril is half way between the fore edge of the eye and the tip of the upper jaw: the hinder nostril half way between the fore nostril and the eye. Mouth and gape large, extending obliquely downwards under the fore quarter of the eye: the lower jaw considerably longer than the upper, and obtuse at the tip: both with a single outer row all round the edges of about twenty-five compressed, triangular, strong, short, intermaxillary teeth, irregular in size and distance, with sharp points, and cutting fore and hinder edges. In front of the upper jaw, at the symphysis or junction of the intermaxillaries, there is a group of from four to six similar, but vastly longer and more slender formidable teeth arranged in pairs behind each other, and locking behind and within a single pair of smaller less elongated teeth at the tip of the lower jaw.

\* In *G. Prometheus*, Cuv. and Val. 10 inches long, depth =  $\frac{\text{length}}{7\frac{1}{2}}$  or  $\frac{\text{length}}{7}$  by figure.

$$,, \text{ } P. \textit{ Atlanticus}, 5\frac{3}{8} \text{ inches long, depth} = \frac{L.}{6\frac{1}{8}}$$

$$,, \text{ } \text{ } \text{ } 16 \text{ } \text{ } \text{ } \text{ } = \frac{L.}{6\frac{3}{8}}$$

$$,, \text{ } \text{ } \text{ } 20 \text{ } \text{ } \text{ } \text{ } = \frac{L.}{6\frac{1}{3}}$$

$$,, \text{ } \text{ } \text{ } 25 \text{ } \text{ } \text{ } \text{ } = \frac{L.}{6\frac{1}{4}}$$

$$,, \text{ } \text{ } \text{ } 30 \text{ } \text{ } \text{ } \text{ } = \frac{L.}{6}$$

$$,, \text{ } G. \textit{ Solandri} \text{ Cuv. and Val. 36 inches long, depth} = \frac{L.}{5\frac{1}{2}}$$



Within the group of large teeth in the upper, lying unfixed and moveable amongst the loose skin at their base, may generally be discovered two or three replacement-teeth, full sized, but yet unfixed by ossification of their base. These are provided no doubt to supply the place of any sudden loss of the larger teeth: an accident to which from their habits and the size and nature of their teeth these fishes must be very liable. Both the vomer and the ethmoid are quite unarmed: the palatines are furnished with a single row of small close-set teeth, like the edge of a fine saw. All the teeth are slightly recurved. Thus the dentition is precisely that of *Alepisaurus*; resembling also that of *Thyrsites* in every respect except the unarmed vomer. The tongue is free and pointed; smooth behind, but rather rough in front with several rows of small round whitish scabrous plates or flattened tubercles, like nail-heads. The edges of the jaws or lips are thin and very even. The maxillaries are entire, simple, and rounded at the ends.

Branchial openings very large, and extending considerably forwards: the membrane is seven-rayed. The opercles like the cheeks and whole head are quite plain, unarmed, thin, or membranous, and a little wavy at the edges; that of the preopercle being somewhat rivulose or veiny, whilst the opercle has a deep broad notch or sinus just above the axil of the pectoral fin. The angle of the preopercle is obtusely rounded. The humeral or scapular bones are not perceptible to the eye: the sides of the tail or fleshy base of the caudal fin are simple, or without any keel; and the whole fish is peculiarly plain in form and structure.

The first dorsal fin begins upon the nape, a little before the fore axil of the pectoral, and extends about two thirds the length of the body without the head or caudal fin, along the back, ending opposite the vent. It is low, and nearly even throughout: its height scarcely equaling half the depth below it of the body; and the rays, except the three or four last, being all of nearly equal length. They are decided spines, but rather weak and slender; the last is often very short, and webbed down to the back behind. The web is excessively fragile or tender. The base of the whole fin is seated in a groove. On the left side of the fish, the fourth, sixth, eighth spines, and so on alternately, appear broader than the rest.

The second dorsal fin begins immediately behind the end of the first, but falling short considerably of the base of the caudal fin, is much shorter in extent; reaching only two thirds of the remaining one third of the body. It is triangular, abruptly elevated in front, and somewhat higher than the first dorsal; at its highest point its height is three fourths or four fifths of the depth of the body beneath. Its two last rays are abruptly produced to twice or thrice the length of the last one or two preceding: from which they are also detached by a space or interval of one ray, and by a great sinus in the web, which is only connected to the base of the foremost of the two; though they are themselves webbed perfectly together; and thus they form a single two-rayed spurious finlet, the latter ray of which is free or not webbed to the back behind, and longer than the first. Though the connection of this finlet with the rest of the second dorsal fin is so slight, yet it is raised a little whenever the hind rays of the latter are pulled forward. The three first rays of this fin are simple and obscure; but barred and not pungent: the fourth or first branched ray is the longest.

The anal fin is lower and smaller: but of equal length, and in every other respect, particularly in its two-rayed spurious finlet, precisely resembling the second dorsal. Its two first rays are simple but barred or flexible: the third or first branched ray is the longest of all. Close before its origin are generally two, almost detached and free, often extremely short, and generally inconspicuous, half-buried spines: the first of which is sometimes reduced to a minute, triangular mere

sharp scale, not more than half a line or a millimeter long, and sometimes wholly wanting: the second is a stronger, more decided spine, partly connected behind by a web to the base of the first simple ray of the anal fin.

In MM. Cuvier and Valenciennes' figure of *G. Prometheus*, t. 222, the anal fin is represented larger than the second dorsal; and there are three detached one-rayed spurious finlets to each, which have no connecting web.

Pectoral fins rather small and weak, oblong or subtrapeziform, and obliquely truncate. They are placed at about one third of the height up the side, close behind the edge of the opercle; and are about one eighth of the whole length of the fish.

Ventral fins reduced in the adult fish to two minute, short, and blunt scale-like stumps or warts, almost buried in the skin, placed close together on the abdominal line a little before a line drawn vertically through the fore axil of the pectoral fins. But when the fish is very young, each consists of a single, straight, rough, sharp, and pretty strong spiny ray, which is rather longer than the pectoral fins, its tip reaching back as far as theirs *in situ*, though its base is situate a little forwarder than theirs: and in this case there is no trace of web or of other rays. Thus it appears that the short scale-like ventrals of the adult fish are the worn or broken-down stumps only of these spines in the young. This mutilation appears to take place constantly and very early. The single example in which I found the ventral spines thus perfect, was five inches and three eighths long: MM. Cuvier and Valenciennes' *G. Prometheus* was only ten inches long, and yet the ventral fins were "infinitely small:" there was moreover "beside the spine some trace of soft ray;" which I also find to be the case in adult fishes.

It would be interesting to discover what peculiarity in the habits of this fish leads to this regular and early mutilation: for in some allied fishes (*Histiophorus* and *Tetrapturus*) in which the ventral fins are reduced to a similar single and even much longer and more slender ray, no such effect takes place. The mere absence of the groove which protects them in *Histiophorus*, will not entirely account for this. It is, however, perhaps partly explained by the consideration that the *Coelho* is wholly a ground or bottom fish; whilst *Tetrapturus* is a surface or pelagic one.

The caudal fin is forked; its lobes are rather broad and short: the upper being a little the longest. It is from one sixth to one seventh of the whole length.

At first with the exception of the lateral line, the whole fish appears quite smooth and naked, or devoid of scales. But examined more closely, the opercles, cheeks, body, second dorsal, anal, and caudal fins are found to be minutely, though to the unassisted eye obscurely scaled: the scales being small and close-pressed, very soft, thin, or membranous, smooth, and deciduous; varying in shape from round to oval.

The lateral line begins very high up, at the junction of the opercle with the body, on the nape; and running straight a little way, makes an abrupt oblique descent about the middle of the pectoral fins; continuing in a straight line below the middle of the sides from their tips to the root of the caudal fin. It is somewhat raised and very distinct throughout: narrower, but not more tumid towards

the tail than elsewhere ; and it is not carinated or gelatinous in any part. It resembles a chain with oblong links ; and is composed of a row of narrow, oblong scales, each with a very wide tube, of nearly the width and length of the scale itself. The upper edge of the line thus formed is more abrupt and prominent or defined than the lower.

Colour of the whole fish an uniform pale, bright, silvery-lead or platinum, tinged more or less with lilac, and with a steely or violet iridescence towards the back : externally black only in flecks here and there upon the body, and towards the edges of the fins, top of the head, membranous edge of the opercle, the lips or bony edges of the jaws, tip of the lower jaw or muzzle, and on the anterior spiny dorsal fin. The inside of the opercles and branchial opening, mouth, gullet, tongue, and whole internal lining of the abdominal cavity are a deep purplish or mulberry black. The teeth are a pale flesh-colour. The irides are silvery iridescent, spotted or clouded with dusky-brown. The second dorsal, the anal, caudal, and pectoral fins are dusky, more or less inclining to black.

This is the uniform appearance of *P. Atlanticus* in the market or on shore : and therefore, when first present at its capture, I was quite unprepared to find the whole fish of a rich coppery or cinnamon-brown, generally of a full dark tint, but varying in different examples in intensity, and reflecting brilliant pink or green metallic iridescence, especially about the throat beneath the pectoral fins. The belly, usually, is scarcely paler than the rest. The iris is brown with golden stains ; the pupil violet-black, not opaline.

In the course of half an hour after death, all the brown disappears upon the body, except a few dirty flecks or stains, which look as if they could be rubbed off, but are permanent : leaving the whole fish, except the fins and parts about the head or mouth, which retain their brown or blackish colour, like burnished silver or block-tin, reflecting all over the most brilliant iridescent, chiefly violet and azure, tints.

On opening the abdomen of a female fish in fine condition, the whole *peritoneum* is found to be purplish black. The *stomach* is an enormous, long, and simple sack, extending the whole length of the abdominal cavity, and of a livid purplish colour. The intestinal canal was adnate to it. *Cæca* eight or ten, finger-shaped, very large but not long, pale ochre-yellow, adnate to the middle-sized and livid-purplish *liver*. The air-bladder is large, very long and simple, oblongo-lanceolate, pointed forwards and much attenuated backwards, or produced into a long, slender point. In this example the abdomen was nearly filled with two enormous elongated masses of distinctly formed but very small eggs or roe, of a pale yellow colour. In other male individuals examined, there appeared no difference, except the presence of the milt in place of these.

The first of the twenty abdominal vertebrae is extremely short ; indeed a mere ring : the ten last are furnished beneath with vertical apophyses, directed downwards in the middle.

The individual figured measured nineteen inches and a half from the tip of the lower jaw to that of the upper longer lobe of the caudal fin.

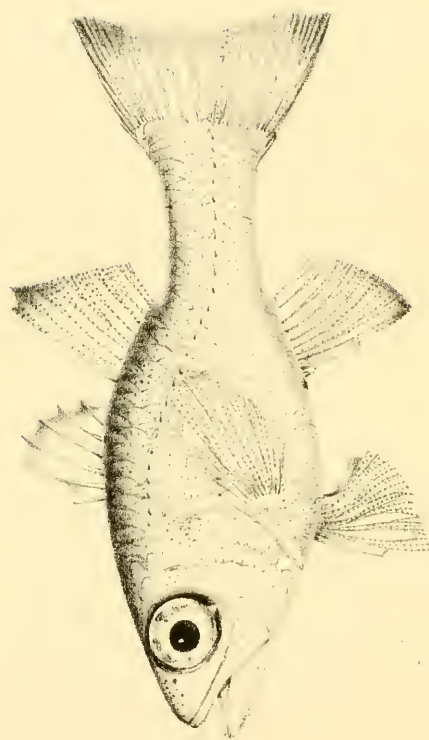
This is a voracious fish, which chiefly feeds on other species of its race. I have taken sometimes fishes five or six inches long out of the stomach of a *Coelho* of two feet in length.

The female fish, of which the anatomy is given above, was captured in the month of August : and that month with the following is the proper breeding season of the species. It was in a particularly plump condition

as to flesh : to which perhaps it might be owing that no trace appeared of the ventral fin-stumps, except a dark scar-like spot, like an imperfectly healed wound, with a fistulose orifice. The flesh had overgrown them, as it also had completely the first of the two free anal spines. This individual measured two feet and a half in length.







*T. L. MY. 3rd. & 4th.*

## TAB. XXI.

## APOGON REX.

*Alcoraz, Alfonsin de rolo, ou A. da costa, ou Salmonête da costa.*

## KING OF THE MULLET.

## CHAR. GEN.

Corpus ellipticum, compressum, in caudam oblongam pone pinnam secundam dorsalem et analem abrupte contractum. Caput supra planum; oculis distantibus magnis; rostro acutiusculo lato. Rictus magnus; maxillaribus nudis; dentibus minutis scobinatis. Operculum inerme. Præoperculum limbatum, bimarginatum; limbo tenni nudo serrulato. Squamæ maximæ, caducæ.

Pinnæ dorsales duæ distinctæ separatæ. Pinna caudalis retusa s. emarginata; lobis abbreviatis latis. Membrana branchiostega septem-radiata. Cæca pauca.

Obs.—Pisces pusilli, aureo-rubescents, pulchelli, victui vix servientes, solitarii, rariores. Species pleræque Indico-orientales, vix occidentales (Americanae); una Mediterraneo-europæa et Maderensi-atlantica. Genus *Mullo* analogum.

## CHAR. SPEC.

A. coccineus, cfasciatus, arenulato-punctulatus: pinna dorsali secunda analique apice nigricantibus.

1<sup>ma</sup>. D. 6; 2<sup>da</sup>. D. 1 + 9; A. 2 + 8; P. 12; V. 1 + 5; C.  $\frac{3 \text{ v. } 4 + \text{VIII.}}{3 \text{ v. } 4 + \text{VII.}}$

M. B. 7; Sq. lin. lat. 25; Vertæ. 10 abd. + 14 caud. = 24.

*Apogon rex mullorum*, Cuv. (Mem. du Mus. 1815) R. An. ii. 136.—Cuv. et Val. ii. 143.

*Apogon ruber*, Risso, iii. 383.

*Mullus imberbis*, Will. p. 286.—Art. Syn. 72; Gen. 43. n<sup>o</sup>. 3.—Linn. Syst. 1. 496, n<sup>o</sup>. 3: haud Rondeletii.

“*Coreulus*, Gesner; *Amia*, Gronov.; *Centropomus rubens*, Spinol.; *Dipterodon ruber*, Rafin; *Apogon rouge*, Lacép.” Cuv. loc. cit.

*Longit.* 4 poll. = 3 — 3½ × alt. capitivæ longit.

*Tempus*, æstate, autumno; sed per totum fere annum.

*Locus*, littoralis: rarior.

FROM Willughby, the able ichthyologist, who furnishes from individuals obtained at Malta an excellent though brief description of this pretty little fish, has been derived its imposing title of “Rex Mullorum,” King of the Mulletts; which is a translation of the name “Re di Triglia,” applied to it at Valetta, as he tells us, by the Maltese fishermen. Having neglected at the time to make exact inquiry, he is unfortunate in proceeding to surmise, that, although the individuals he saw were scarcely a

hand's-breadth long, the above lofty-sounding title might have been given to this fish on account of its pre-eminence in size (ob magnitudinem eximiam); meaning, of course, amongst the Mulletts. Such names, however, down from Homer's ἄναξ ἀνδρῶν to the Roman satirist's "Rupilius rex," and whether given in the way of compliment or sarcasm, relate by no means necessarily to the above-named quality. In this little fish's general resemblance to the Red Mulletts, combined with its comparative rarity, or at least solitary habits, to say nothing of its truly regal gold, and scarlet or purpurascant mantle, will be found a real and sufficient clew to its elevation to the titular dignity of their monarch.

The same author also is the first to call it *Mullus imberbis*; though, as he remarks himself, this name had been applied already by Rondelet to a very different fish, the *Trigla lineata*, L. Bl.

This little fish seems to be generally dispersed throughout the Mediterranean; but does not appear to have been often noticed on this side the Straits of Gibraltar. In their sixth volume, MM. Cuvier and Valenciennes remark, however, that it has been received from Teneriffe.\* At Nice, Risso relates that it is called Sarpanansa: and MM. Cuvier and Valenciennes collect from other authors that it is known at Genoa, where it is rare, by the names of Castagnena rossa, or Castagnau rouge; at Iviça by that of Cagna-vieja-rosa; and in Sicily by that of Munacedda russa.

In Madeira, although generally known to the fishermen, it has not acquired any fixed or certain name; and it is certainly one of the rarer fishes. It is taken, however, in the shore-nets, or fish-baskets, at all seasons; yet scarcely more than two or three ever occur together. I have captured it myself in a small net worked at night upon the scant sandy beach in the little bay of Machico in the month of August; and I have also had it brought to me caught by a hook baited with shrimps (*Palæmon Squilla*, Fabr., or *Pontophilus Pristis*, Risso,) off the rocks by night at Magdalena: but it is rarely, if ever, captured in any way by day. It breeds from August to November; and the spawn before exclusion is of a peculiarly bright orange or red-lead colour, like that of a boiled crab or lobster: yet its appearance on these shores most certainly not, as supposed by MM. Cuvier and Valenciennes in regard to the Mediterranean fish, confined to this its breeding season: nor can I here discover any evidence to prove that at any part of the year "il se tient dans des profondeurs inaccessibles;" though it is unquestionably a night-feeder;† a habit which accounts, perhaps, sufficiently for the great size of its cys, no less than for its rarity.

\* Cuv. et Val. Hist. vi. 493.

† The fishermen see them occasionally by day, but cannot tempt them to take the bait.

When fresh, or yet uncooked, this fish has a peculiar mouse-like odour, resembling that also of the common Hounds-tongue (*Cynoglossum officinale*, L.). Risso speaks of its excellence for eating; a remark which MM. Cuvier and Valenciennes on his authority repeat. In Madeira it has the same character with the fishermen, though it is scarcely cooked except by accident.

The average length of this diminutive monarch of the Mulletts is three or four inches. Risso speaks of nearly five, and MM. Cuvier and Valenciennes of six inches, as the extreme length of the Mediterranean fish; but in Madeira I have not observed it to exceed four and a quarter. In colour, in the deciduous large scales, and, above all, in the shape and separation of the two dorsal fins, it has sufficient general resemblance to the Red Mulletts to account for the reference expressed in some of its vernacular titles: but this relation systematically is evidently, as Wilughby acutely first remarked, one only of analogy.\* In its more essential characters, both outward and internal, it agrees with the *Percidæ*.

Its scientific name *Apogon* is derived from an obvious character of difference when viewed in contrast with the Mulletts; being formed of the privative  $\alpha$ , and  $\pi\acute{\omega}\gamma\omega\nu$ , a beard.

Though by no means elegantly shaped, this is a peculiarly frail or delicate fish, both to the eye and touch: the flesh being at once almost transparent, and singularly soft or flexible; exposing by collapse the arrangement of the ribs and muscles on the outer surface of the sides, in oblique lines or forks, diverging from the lateral line.

The shape of the fore-part of the body, cutting off the tail, is oblong-oval or elliptic, suddenly contracting at the end of the second dorsal and the anal fins to one half the depth of the body forwarder. The fleshy part of the tail, beginning from this point, is considerably produced, and of nearly equal depth; or oblong, with the dorsal and ventral outlines almost parallel: those of the elliptic fore-part of the body being of moderate and nearly equal curvature. Both the depth and thickness are considerable in proportion to the general dimensions: the former, greatest from the origin of the first to that of the second dorsal fin, being from one third to one third and a half of the whole length; and the thickness close behind the eyes, equalling one half of the depth, or one sixth of the whole length. Still the whole fish is compressed. The profile descends gradually in a straight line from the origin of the first dorsal fin to the tip of the muzzle. The length of the head equals the greatest depth: it is broad and flattened at the top, with a slight central ridge. The space between the eyes is very wide, and nearly equals their diameter, which is about one third of the length of the head. Their orbits are nearly circular, and quite plain or entire, and unarmed; but raised and prominent

\* “Quantum memini, capitis figura cum Mullo non convenit: barbulis autem caret. Verum cum piscatores Mullorum regem eum appellaverint, plurimisque accidentibus cum Mullis conveniat, ut descriptiones utriusque conferenti patebit, rectius me iudice *Mullus imberbis* dicetur quam is quem Rondeletius sub eo titulo exhibet, cuculis congener, nec quicquam fere præter colorem cum Mullis commune obtinens.”

all round like a rim. The muzzle is rather short, scarcely equalling the diameter of the eyes in length; somewhat pointed in profile, but flattened, broad, and obtuse, when seen from above. It has nothing whatever of the peculiar physiognomy of the Red Mulletts: the lower jaw, which is sometimes a little longer than the upper, is without any beard at the tip or symphysis. The nostrils are two simple orifices in the usual place; the anterior smaller one being halfway from the eyes to the tip of the muzzle, and the hinder one close to the orbit. The mouth, or at least the gape, is large; the latter reaching back beneath the eyes, with the maxillary long, distinct, and broad at the ends, but altogether plain and naked. The teeth are fine and velutine, set in a narrow band round both the jaws and on the palatines, and in a horseshoe patch upon the *vomer*. The tongue is smooth, and its tip free or distinct.

Preopercle somewhat rounded or not at all angular below; its border naked, broad, lamellar, very thin and pellucid, finely striate, and irregularly dentate at the edge, running parallel to and some distance within which is a thick raised bony rim or inner more entire margin.\* Opercle rather broad, unarmed or without any spine, but with the angle just above the pectoral fins distinct, and firm or bony: its margin rounded, thin and membranous. The humeral bone is indistinctly visible as usual in the axil of the pectoral fins, but forms no spine. The supescapular is a distinct bony parabolic scale or plate, with a longitudinal ridge or keel, at the junction of the opercle with the body, or origin of the lateral line, high up the shoulder.

The pectoral fins are large, broad, and oblong; obtuse at the tips, which reach to the origin of the anal fin. They are placed about one third of its height up the side. Their first ray is short: the second long and barred, but generally unbranched.

The ventral fins are placed close together on the belly, beneath or a little before the pectoral, and are large, equilateral, and triangular, with the spine strong, compressed, and sharp at its fore-edge. The other rays are very strong and very copiously branched, and the last is partly webbed to the body. They have no scaly appendage at their fore-axil; but a large distinct one on the ventral line between their base.

The first dorsal fin begins at the commencement of the back, at one third of the whole length of the fish, and over the fore-axil of the pectoral or ventral fins. It is short and subtriangular, and as high as long; its height or length being contained twice and a half in the depth of the body beneath it. The first ray is short; the second and third are strong, the longest of all, and equal to each other in length and strength: the remaining three are weaker and gradually shorter; and the last is webbed behind to the back.

The second dorsal fin begins where the body first contracts in depth, and is separated from the first dorsal by an interval of two or three scales' breadth. It is short and triangular, but considerably higher in front, and rather longer than the first dorsal. Its height equals the depth of the body beneath it. The first ray or spine is strong, and half the length of the two or three following branched rays, which are the longest of all: the last of these is free behind.

The anal fin corresponds in size, shape, and position, with the second dorsal; but is neither, perhaps, quite so high, nor so pointed or angular. Its first spine is very short: the two first branched rays are the longest, and are twice the length of the second spine; the last ray is free. The base of the second dorsal and of the anal fin is tumid, raised, and fleshy, forming a sort of ridge.

Caudal fin large and deep, but short, and rather emarginate than lobed, or

\* Or, as MM. Cuvier and Valenciennes express it, "une crête saillante, qui forme un double rebord en avant du bord ordinaire."



with the lobes very short and broad. Its accessory rays are flexible and weak. The spines of all the other fins are rather strong and glassy.

Scales very large, and easily coming off with handling: their edges rough and ciliate. They cover the opercle, and cheeks or preopercle, except its border: but the top of the head, the maxillary, muzzle, and lower jaw, like all the fins, are quite naked.

The lateral line is moderately arched throughout, beginning high on the shoulder and descending gradually to the middle of the body, which it attains at the end of the second dorsal fin: thence running straight and in the middle of the tail to its end. Each of its scales *in situ* has the appearance of being marked with a raised lance-like point.

Colour a bright cherry-red, or scarlet washed with delicate carmine or purple, and reflecting the most brilliant golden tints, which, however, soon disappear after capture: inclining to dusky on the back, paler on the belly; and sprinkled all over, but more especially behind the eyes and about the edges of the opercles, when attentively observed, with minute dusky or blackish dots or pores, as if sanded; otherwise without markings, spots, or bands. The golden lustre on the sides appears in oblique flexuose S-like lines, following the direction of the muscles. The fins are uniform red, like the rest: the second dorsal and the anal being tipped only with black, and the outer rays and tips or angles of the caudal fin also tinged more faintly with the same. The eyes are peculiarly beautiful and brilliant: the iris silvery, tinged with copper-red, and clouded more or less with dusky. The mouth inside and tongue are pale or whitish.

There is no trace of the black spot on each side at the base of the caudal fin, insisted on by MM. Cuvier and Valenciennes; but, without specimens of the Mediterranean fish for comparison, it is impossible to judge whether this difference is of any value. In other points, except the number of the vertebræ, the description by the above-named authors sufficiently accords with the Madeiran fish.

The liver is large: the stomach small or moderate: the cæca four in number, large, definite, distinct. The intestine is large but short, making only one short volution, and then going straight to the vent. Air-bladder large, simple, oval-oblong. Peritoneum beautifully perlaceous-white.

In the Mediterranean fish the vertebræ are stated by MM. Cuvier and Valenciennes to be twenty-five in number, of which nine only are abdominal. In the Madeiran fish the whole number of vertebræ is twenty-four, of which ten are abdominal; and of these, the five last are furnished with divergent apophyses beneath, which unite at the base in the two last into a stalk to their fork.

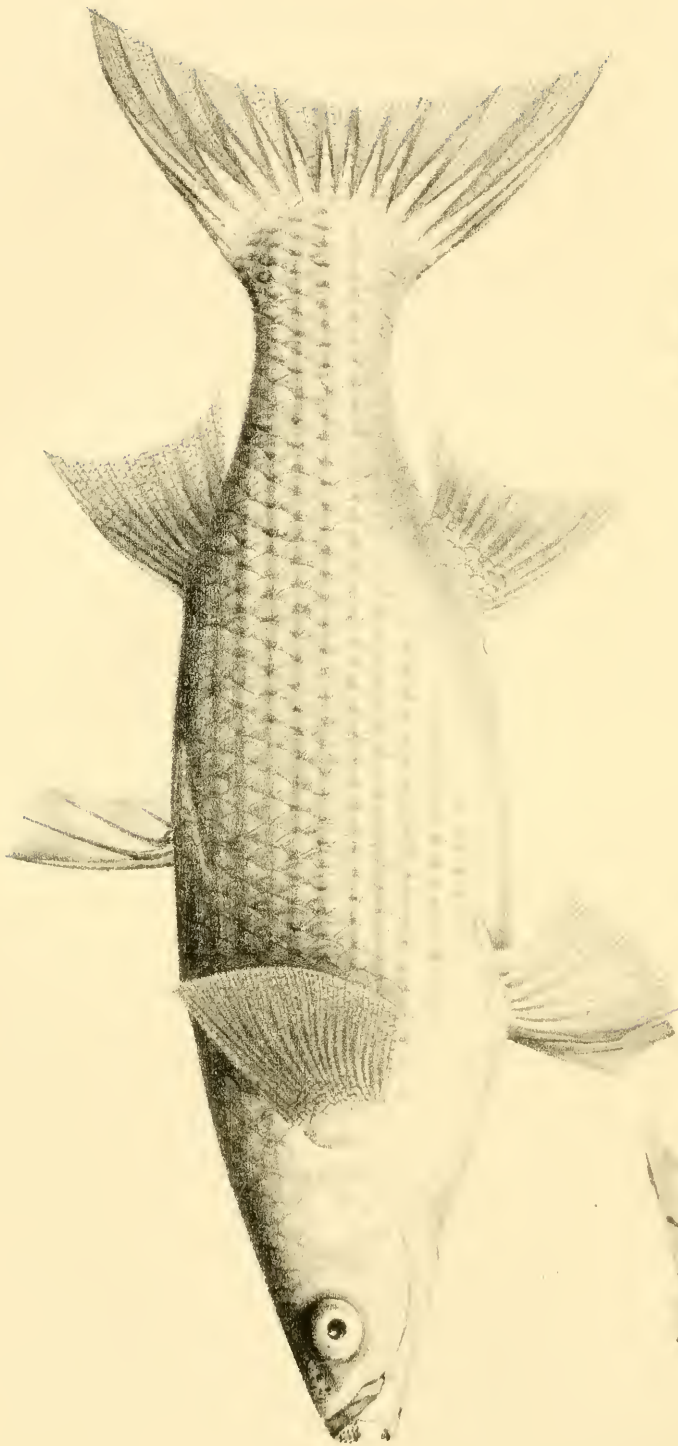
The skull is extremely curious, and remarkable in structure; with large post-orbital cavities, and with the supraorbital margins excessively dilated, broad, and prominent, as if winged. The cerebral cavity is very large, convex, smooth, and even; without any central keel or crest, but with a pair of little spinules, pointed forwards, above in front, and another pair behind, farther apart from each other, at its broadest part, on the hinder end of the supraorbital wings.

There is a peculiar sort of glassiness or lightness in the aspect of this fish which is very difficult to express by the pencil, in its combination with high colouring.

The figure is the size of life.







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## TAB. XXII.

## MUGIL CORRUGATUS, NOB.

*Tainha*, ou *Muja*.

COMMON OR ROUGH-LIPPED GREY MULLET OF MADEIRA.

## CHAR. GEN.

Caput subquadratum, depressiusculum, supra planum; operculis subtumidis; rostro retuso; ore rictive transverso, horizontali; labio superiore incrassato, lato; dentibus (setaceis) uniseriatis, aliquando nullis; maxillæ inferioris costa antice elevata extante. Pylorus ventriculiformis, parietibus cartilagineis incrassatis.

*Obs.*—Pisces magnitudine mediocri, agillimi, vafri, edules, cosmopolitæ, littorales; junioribus æstuariis s. subfluvialibus.

## CHAR. SPEC.

*M. subellipticus*: labro superiore lato, crasso, inferne rugifero s. alveolato; inferiore simplici, margine tenui; dentibus inconspicuis: maxillarum extremitatibus (ore clauso) expositis: suborbitariis haud emarginatis, minutissime crenulatis: naribus approximatis: pinna dorsali prima altiore quam longa.

$$1^{\text{ma}}. D. 4; 2^{\text{da}}. 1 + 8; A. 3 + 9; P. 1 + 17; V. 1 + 5; C. \frac{5 + \overline{I + VI.}}{5 + \overline{I + V.}}$$

*M. B.* 6; *Sq. lin. lat.* 43; *Vert.* 11 abd. + 13 caud. = 24.

*M. corrugatus*, *Syn. Mad. Fish.* p. 184.

*Longit.* = 1 — 2 pedes = 4 × alt. = 7 — 8 × lat. = 5 — 6 × long. cap.

*Tempus*, autumnno, hieme: sed per totum fere annum.

*Locus*, in littore æstuariisque: vulgatiss.

PEOPLE acquainted only with the common English names of fishes, are apt to be confused by the modern vernacular application of the same generic name of Mullet to the Red or Sur-Mullet (*Mullus barbatus*, or *surmuletus*, L.) and the Grey Mullet (*Mugil cephalus*, or *capito*, Cuv.); as if they were distinguished mainly by the characters expressed in their respective affixes. It adds to the confusion, that some real ground for this community of name assuredly exists in a certain similarity of shape, in the large scales, the feeble teeth, and more particularly in the form, the nature, and position of the two dorsal fins. In other tongues, however, there appears no trace of this confusion or relationship: the Red and Grey Mullets being called respectively in Greek, *τρίγλη*, and *μυστρεὺς* or *κέφαλος*; in Latin, *Mullus* and *Mugil*; in Italian, *Triglia* or *Tria*, and *Cefalo*; in Spanish,



Salmonete and Mugel; and in Portuguese, Salmonéte and Tainha, or more rarely in Madeira, Muja.

The Grey Mulletts (*Mugiles*) of Europe, reduced by Linnæus and other naturalists of the last century to a single species (*M. cephalus*, L.), were certainly much better understood both by the ancient Greek and Roman writers, and by several ichthyologists of the sixteenth and seventeenth centuries; who, following the lead afforded by the common names and popular distinctions of the fisherman, have arrived at more correct conclusions than their successors; though they failed in placing them on record, or establishing the species, with the precision of close modern definition, or with a systematic accuracy of comparative detail. The researches of the last ten or fifteen years, supplying these defects, have also ascertained again the species to be very numerous; those of different countries possessing under a strong general resemblance in habits, form, and colouring, minute but permanent and easily appreciable marks of difference.

Thus Aristotle, with some variation, and indeed confusion in their specific titles,\* records the existence of three or four sorts at least of

\* *E.g.* In lib. E. cap. 4. sect. 6. (edit. Schneid.), after mentioning the *κιστρειὺς* proper by itself, he enumerates these four as kinds of *κιστρειὺς* (τῶν κιστρείων or κιστραίων): viz. the *χιελῶν* (some read *χάλλων*: Athenæus, vii. 77, Dindorf, 2. p. 667, quoting the passage, *χιελῶν*);—the *σάργος* (some have *σαργός* or *σάργων*);—the *μύζων* (some read most erroneously *μύζων* or *σμούζων*: Athenæus, loc. cit. *μύζοι*);—and the *κέφαλος*. In another place (Θ. 2) he speaks again, besides the *κιστρειὺς*, of two kinds of *κέφαλος*; and says, that one of these, which some call *χιελῶν*, lives near the shore (*πρόσγειος*); but that there is another sort, living remote from the shore (*περφαίος*), which feeds alone on its own slime (*μύζα*); so that it is always with an empty stomach as from fasting (*διὸ καὶ νηστὶς ἔστιν αὐτῇ*). Hence Cuvier, after Rondelet, conjectures with much plausibility that this is the sort which Aristotle elsewhere calls the *μύζων*: whilst it is also very likely Dorion's *νηστὶς* (Athen. vii. 77). In Z. β. 1, the *κιστρειὺς* and *κέφαλος* alone are mentioned together: and in Z. ις. 1 and 2, the *χιελῶν* and *μύζων* first together (*χιελῶνα τῶν κιστρείων καὶ μύζωνά*); and then presently the *κέφαλος* and *κιστρειὺς* separately. It is observable, that these two latter passages, taken together, make up four out of the five sorts mentioned in the passage first above referred to (E. 4. 6). And since, moreover, the insertion of the *σάργος* in this list, which has so much puzzled editors and commentators, rests only on this single passage, it may well be either a mere *lapsus*, or no more intended for a formal recognition of the *σάργος* as a genuine kind of *κιστρειὺς*, than the similar citation of the *ἀθερίνη* with the *κέφαλος* as of the tribe in a single passage (Z. ις. 2) seems to be. Indeed, such occasional associations of very different fishes, founded on some passing conventional character of agreement, or on some point of slight or general relation (such as mode of capture (E. 4. 1), colour, quality, or certain habits) are not unfrequent in our author: of which the following is a fair example; being also one in point as to the present fishes: “ὡσοκοῦσι δὲ πάντες οἱ λιπιδωτοὶ, ὅσιν λάβραξ, κιστρειὺς, κέφαλος, ἔτελις, καὶ οἱ λευκοὶ καλούμενοι πάντες, καὶ οἱ λεῖοι, πλὴν ἐγγέλυος” (Z. β. 1). That the idea of association in the present case was more particularly colour, might perhaps be argued from the word *λευκοὶ* in this passage, taken in connection with the generic name of *λευκίσκος*, under which Hicæsius, in Athenæus, enumerates the Grey Mulletts. At all events, the *σάργος* is abundantly distinguished from the *κιστρειὺς* in the following passage: “Σάργος κύσκειται μὲν περὶ τὸν Πισσιδῶνα μῆνα, κύει δὲ ἡμέρας τριάκοντα· καὶ ὃν καλοῦσι δὲ τινες χιελῶνα τῶν κιστρείων (κιστραίων, Schn.), καὶ μύζωνα, τὴν αὐτὴν ἄραν κύουσι τῷ σάργῳ.” Arist. Z. ις. 1.

genuine *κεστρεὺς* in the Mediterranean: the word *κεστρεὺς* seeming to be employed by him sometimes generically, like *κέφαλος* in Θ. δ. 2, or our *Mullet*.\* Oppian and Ælian speak only of the *κέφαλος* and *κεστρεὺς*; the latter, however, distinguishing a sharp-nosed sort of *κέφαλος* from the ordinary kind (lib. i. cap. 12). But Hicesius again, in Athenæus, (vii. 77, Dindorf, 2. p. 667,) mentions under the generic name *λευκίσκος* four kinds: viz. *κέφαλοι*, *κεστρεῖς*, *χελλῶνες*, and *μύξινοι*. And this is the conclusion which long after, in the sixteenth century, Rondelet adopts: calling his first sort *κέφαλος* or Cephalus, and Capito; his second *κεστρεὺς* or Cestreus, which he very inaccurately observes is also called *νῆστις*,† and *βάκχος*,‡ and *περαιάς*,§ and *σαργῖνος*;|| his third *χελών*, Labeo or Chelon; and his fourth *μύζων*, or *μύζων*, or *μύζινος*, Myxon. From this conclusion, as it has been mentioned, Willughby, Artedi, and Linnæus, with their followers in the eighteenth century, fell back; and it was only at its close, or from the beginning of the present century, that juster views began to reappear.

By the successive labours of Laroche, of Risso, Savigny, the Prince of Musignano, and, above all, of the illustrious Cuvier, six common Mediterranean species have been ascertained, and accurately by the last-named author and his able coadjutor, M. Valenciennes, defined. Of these, two only until recently had been discovered in the British seas; but Mr. Yarrell has with his accustomed exactness and research been enabled to detect a seventh European or third British kind. Whether the present species, perfectly distinct among the three inhabiting these coasts¶ from all of these, may be considered as an addition also to the European race, will depend upon the views held of the proper geographical relations of Madeira.

Of the three Madciran species of Grey Mullet, one, *M. cephalus*, Cuv., is so rare and local, that the fishermen are wholly unaware of its existence; but the other two are recognized in Funchal, if not generally

\* Schneider reads in two places (E. 4. 6 and Z. 15. 1), where the word is plainly used generically, *κεστρεῖας* for *κεστρεὺς*; but this seems scarcely necessary. In the beginning of Θ. δ. 2, *κεστρεὺς* is also unequivocally used generically without the article; and then, in the next sentence, with the article. “Ἀλληλοφαγοῦσι δὲ πάντες μὲν πλὴν *κεστρεῖας*, μάλιστα δὲ οἱ γόγγροι. Ὁ δὲ *κέφαλος* καὶ ὁ *κεστρεὺς* ὅλως μόνον οὐ *σαρκοφαγοῦσι*.” But even in this latter sentence *κεστρεὺς* is not necessarily used specifically, as at first it seems to be: for, presently after, the author speaks of “*πᾶς κεστρεὺς*,” and of two sorts of *κέφαλος*: so that both words may be used alike generically in both sentences of the above quotation.

† Dorion, in Athen. vii. 77. Confer Arist. Θ. δ. 2; et supra, p. 156, note.

‡ Hicesius, in Athen. loc. cit.: who says that the *χελλῶν*, not the *κεστρεὺς*, is so called.

§ This is rather a descriptive epithet than name; and it is besides applied by Aristotle to a *κέφαλος*, not *κεστρεὺς*. See Arist. Θ. δ. 2, or note at p. 156, supra.

|| This is merely Rondelet's conjectural emendation for *σάργος* in Arist. E. 4. 6.

¶ Viz. *M. corrugatus*, Nob.; *M. auratus*, Risso; and *M. cephalus*, Cuv.

elsewhere, by the more experienced of them; and are brought alike into the market, though with very far from equal regularity or abundance: the subject of the present chapter, *M. corrugatus*, constituting the main supply, and being generally, at least upon the southern coast, the common staple species of the market. It is caught more or less throughout the year; but chiefly in the autumnal and winter months, and in shallow water (three to five fathoms) near the shore, in nets. It varies much in excellence or quality; but, speaking generally, it is more rank or muddy-tasted in the spring or summer, as Rondelet observes of *M. cephalus*, than late in autumn or in winter.

Old fishes, which are very common, should be carefully avoided: for, when boiled, the skin and muscles become strongly contracted, separating from the bones, which they leave bare; and the flesh is very tough, hard, and tasteless. Such fishes may be known in the market, not so much by their size, as by the largeness of their scales and scurfy look. This fish may be kept well, and often with advantage, till the second day; and it is much improved, after transport up into the country, by immersion in cool spring-water for a few hours before cooking. It is best boiled; but, if scored across soon after capture, it may be also broiled, when not too large. When not exceeding six or eight inches in length, the young are peculiarly delicate, if fried. The full-sized fishes, of from one and a half to two feet in length, weigh five or six pounds; but those which are from one foot to a foot and a half are perhaps the best. This fish rarely exceeds two feet in length, and then only by a few inches. Its breeding season is in the winter, as Aristotle long ago observed of the other species; and the male is found in milt from December to April, and even as early as November;\* in which month and the following this Mullet is perhaps in best season for the table. The female is full of eggs in a forward state of development in December.

This, like its congeners, is a plain-coloured but peculiarly neat-looking fish, remarkable for its small head, large scales, and a certain compactness or solidity of form and neatness of aspect, caused no less by its general soberness of colouring than by the absence of all sculpture or appendages about the head or opercles. Its singularly corrugated upper lip will serve for its immediate discrimination from all other European species. In this character it approaches *M. cirrhostomus* of Forster (Cuv. and Val. xi. 127. t. 312), *M. crenilabis*, Forsk. and their allies: but it is at once to be distinguished by the non-concealment of the maxillaries under the suborbitaries when the mouth is closed, besides differing abundantly in many other points. It is again remarkable, that so

\* I have found the male at the end of April with the milt still large, soft, and creamy.

well-marked a species, abounding in the market almost at all seasons, should have so long remained unnoticed by the naturalist.

Shape elongate, elliptic rather than oblong, or deepest in the middle, and pointed towards each end: very thick, broad, and flattened above, forwards at the head and shoulders; thence gradually backwards more compressed. The greatest depth, which corresponds with the middle of the body, or the first dorsal fin, is one fourth of the whole length; and the greatest thickness at the shoulders is about one seventh of the same. The curvature of the dorsal and ventral lines is nearly equal; and it is also regular and uniform.

The head is small, roundish, broader than deep, and with the nape and fore-part of the back behind it flattened above: its profile from the nape descends rapidly, but continuously with that of the back from the first dorsal fin, to the tip of the muzzle. Its length is from one fifth to one sixth of the whole length. The muzzle is rather long, extending fully a diameter and half before the eye, and equalling between one third and one fourth of the length of the head. It resembles strongly, like the whole head and profile, that of *M. chelo*, Cuv. and Val. t. 309. The nostrils are two small oval orifices close to one another, a little before the eye on a line with the upper part of its orbit. The eyes are round, of a moderate size, their diameter being one fifth the length of the head: the space between them is flat, and equals nearly three times their diameter. They are devoid of any particular gelatinous covering membrane, veil, or eyelid, but are surrounded by a narrow smooth gelatinous space or ring. Before their lower fore-corner appears the bony, hard, triangular suborbital; the lower rounded or obliquely truncate end of which is very finely and minutely crenulate, with the fore-edge nearly straight and but slightly concave, as in *M. capito* or *chelo*, Cuv.: not distinctly hollowed out, or notched, as it is in *M. saliens*, Risso, or *labeo*, Cuv. Owing to the length of the maxillaries, which are twisted like the letter S, their ends appear below the corners of the mouth, reaching altogether below a horizontal line drawn backwards along the lower edge of the orbit from the corners of the closed mouth; exactly as described in *M. labeo* by MM. Cuv. and Val. vol. xi. p. 56, and figured at t. 310; although the suborbital itself in its figure and crenulations perfectly resembles rather that of *M. chelo*, Cuv. and Val. t. 309.

Upper lip excessively broad, fleshy, thick, and prominent, or convex; forming, when the mouth is closed, an abrupt and truncate termination vertically to the muzzle. Two thirds of its surface are perfectly smooth and even: but the lower third part bordering the mouth is, as it were, frilled and honeycombed, or singularly corrugate, with little short obliquely lunate flaps or plaits of skin disposed quincuncially in close-set oblique rows: its lower edge remaining perfectly entire. Within its lower edge, and as it were imbedded in its substance, so as to be discernible with difficulty and very inconspicuous, are several rows, or rather an irregular narrow band, of excessively fine, short, minute, bristle-like teeth. The lower lip is quite thin at the edge, and toothless: it is strongly notched in the middle; and within the notch, inside, there is a strong projecting cartilaginous or bony tubercle, which is the termination of a prominent soft ridge or keel within the mouth. The palatines and vomer are distinctly but very finely scabinate or rough. The tongue is small, and also faintly rough.

The opercles and cheeks are covered with large scales concealing their divisions, and the former are unarmed and simple, close-pressed and compact. The preopercle is triangular, with a subacute angle, which is rather prominent backwards; and its edge, like that of the opercle, subopercle, and interopercle, is perfectly entire. The edges of these three last form an even curve, resembling a quadrant



of a circle: and the edges of the interopercles meet under the throat, concealing the six-rayed branchial membrane; and, running straight and parallel from the level of the eyes quite to the tip of the lower jaw, leave only a narrow straight and even line or commissure, furnished with five or six pores on each side forwards towards the front.

The first dorsal fin is placed in a slight groove halfway between the tip of the muzzle and the base of the caudal fin, but a little behind the centre of gravity. It is abrupt, short, and high, or vertically oblong; its height more or less\* exceeding the length of its base, and nearly equalling half the depth below it of the body. The bases of the three first spines, which are of nearly equal length and strength, are very close together, and placed sublaterally to each other, so that they fold together very curiously and compactly; the first shutting in between the second and third. The fourth spine is remote, and much weaker and shorter than these three: it is webbed down to the back behind; and in this web there is often, probably from injury, a notch or sinus. On each side its base is a long acuminate adpressed free lamina, formed of a row of gradually narrower and more pointed imbricated scales, the tip of which reaches a little beyond the end of the base of the fin, or to the tip of the fourth spine, when recumbent. It resembles that which is found at the fore-axil of the ventral fins in this and so many other fishes. The first spine, like the web, is naked: but the second and third are minutely scaled alternately on one side only; the second on the right, the third on the left side of the fish.

The second dorsal fin begins halfway between the commencement of the first dorsal and of the caudal fins. It is high, short, and subrhomboidal, with the outer margin arcuato-concave, and the front edge convex: twice as high in front as behind, yet with the last ray longer than the one or two before it. Its height in front exceeds the length of its base; equalling the distance from the base of its first to the tip of its last ray. Its first ray is obscure, simple, but not pungent; and the second, or longest, partakes more or less of the same characters. The remaining rays, like those of all the other fins, are peculiarly broad or stout, and copiously branched. Its base is thick and fleshy, not in a groove, or furnished with any appendage like the first dorsal, but with scales extending up between the rays in imbricated lines. The last ray is neither double nor webbed to the back behind.

The anal fin begins and ends a little forwarder, and is longer, with both ends more pointed in proportion to its height; but nearly corresponds with the second dorsal in its characters. It has however three instead of one obscure simple ray in front, and its last ray is double or distinctly bifid.

The pectoral fins are short or broadly ovate, being only one seventh of the whole length of the fish. They are placed halfway up the side, and have a sort of skinny sheathing pouch or membrane at their upper or fore axil; but no elongate or enlarged scale, like *M. cephalus*, Cuv. The first ray is simple or unbranched.

The ventral fins are not much shorter than the pectoral; but are proportionately broader, or nearly equilaterally triangular. The first ray or spine is often scarcely pungent, but rather flexible. The five next rays are copiously branched; and the last of them is webbed completely to the body. These fins are placed decidedly behind the pectoral, not quite halfway between them and the first dorsal fin. They have a long acuminate imbricate appendage, formed of pointed scales, originating from their front axil, and forming a slight horizontal ridge along the side, beneath which they lie, when reclined or folded up. The first dorsal fin

\* It is not perhaps uniformly so high or vertically oblong as in the individual figured, but is sometimes more triangular.



corresponds with the middle point between them and the beginning of the anal fin.

The caudal fin is large and powerful, but rather lunate than forked; its lobes being very broad and short. Their longest rays, reaching to the points, are simple: and the rays between these are peculiarly stout and copiously branched, with rows of conspicuous pointed imbricated scales running up between them.

The scales are very large, quite smooth to the touch, and with apparently entire edges, *i. e.* to the unassisted senses *cycloidal* (Agassiz): yet, when examined with a high power of the microscope, they prove to be neither properly cycloidal nor ctenoid; having the edges of the superimposed laminae finely and minutely denticulate or rather crenulate; being in fact completely intermediate between the two above-named structures.\* They are disposed in regular longitudinal rows of from forty-three to forty-five in number, from the edge or axil of the opercle at the upper axil of the pectoral fins, to the base of the caudal fin, where they become smaller, softer, and confused. There are about sixteen or seventeen scales in a vertical line at the first dorsal fin. The elongated scales at the base of the same, and at the fore-axil of the ventral fins, have been already described: there is neither elongated nor pointed scale at the upper axil of the pectoral fins.

The lateral line is indistinguishable either by the eye or by the structure of its scales from the rows above or beneath its usual place.

Colour a bluish grey, becoming blackish, dark, and dusky on the top of the head and back, and paler down the sides, which are striped longitudinally in regular straight lines along the middle of each row of scales with ten or eleven narrow equidistant dusky streaks, becoming faint and evanescent on the belly. Each scale *in situ* appears also bordered near the margin with a dusky crescent. The belly, throat, lower jaw, and cheeks up to the lower edge of the orbit, are pure opaque or milky white. The ventral fins are white, except the first ray, which is somewhat dusky or greyish. All the other fins are dark grey. The upper part of the upper lip is dusky grey or blackish: its lower part is white or flesh-colour. The iris is dark rich brown, varied with golden, and with the inner edge golden.

The fry have a distinct brassy or metallic yellow spot or patch on the opercle, which they for the most part lose when they attain the length of eight or ten inches. It is, however, now and then retained, though in an evanescent state, in full-sized fishes.

On opening the abdomen, it seems to be filled with the large and extremely voluminous intestine, which makes three or four volutions, and is singularly and beautifully punctate or reticulated, like fine lace, especially towards the vent. The stomach is rather small, and singularly shaped, being exactly pear-shaped, or conical and clavate at the top. The entrance from the œsophagus is in its middle; and the ascending branch, or pylorus, which forms its fore or upper part, swells out into a sort of hard gizzard, with thick cartilaginous *parietes*; at the top of which, out of a hollow like a navel, issues the intestine, surrounded at its origin by six distinct and large but short finger-like *cæca*, of a pale colour, and rosy at their pointed tips: the upper part of the stomach being also shining, pale, or whitish. The liver is of moderate size, but short, and of a dark colour. The air-bladder is large, oblong-elliptic, extending the whole length of the abdominal cavity, but adnate throughout to the upper part of the same, from which it is not separable. The whole peritoneum is dark or blackish.

The intestines are of a very tender substance, easily ruptured; and, like the

\* See also Annales des Sciences, xi. 347, 369 (June 1839): xiii. 61 (Jan. 1840); and xiv. 108 (Aug. 1840).

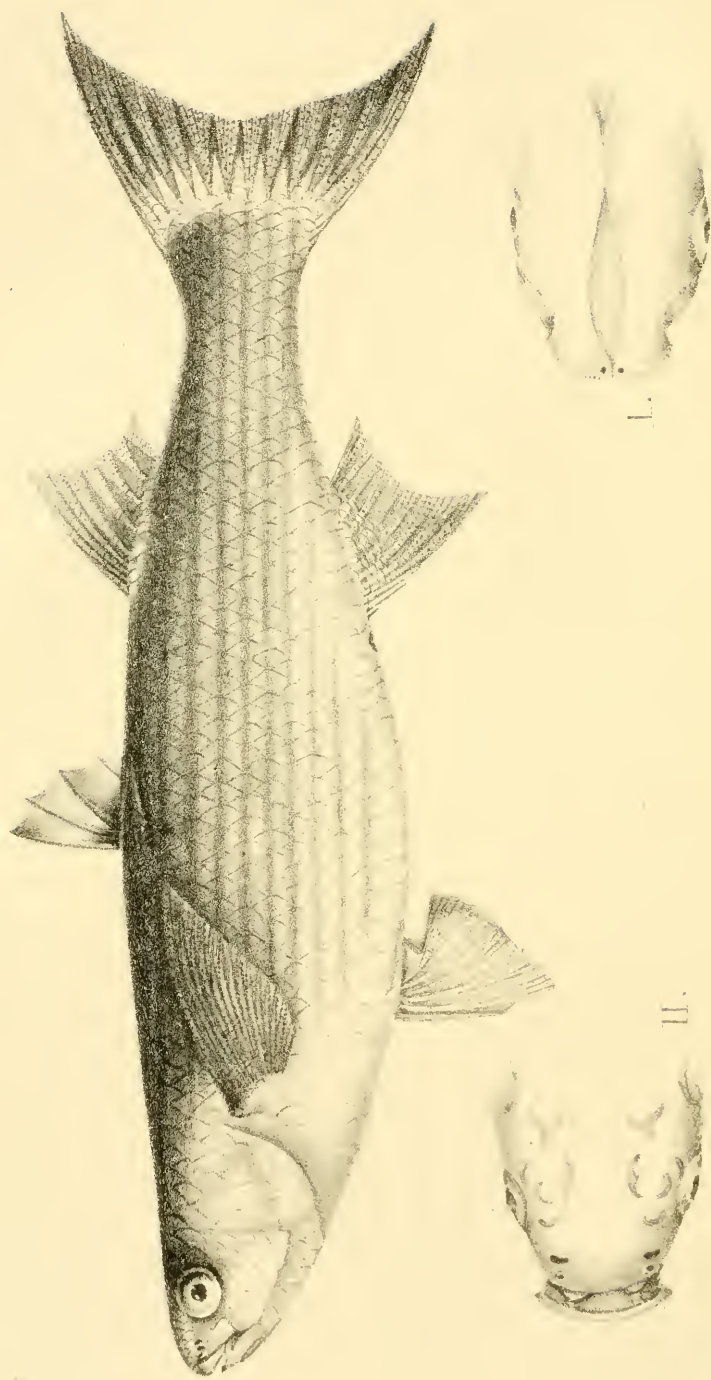
stomach, generally gorged with a semi-fluid or pulpy uniform mass of an olive-green colour, and a very fetid smell.

All the eleven abdominal vertebræ have very large triangular and winged or dilated widely divaricate apophyses beneath; of which the anterior, except the first pair of all, are the longest: the hinder being gradually shorter, except the last pair or two, which are again a little longer than those immediately before them. The superior (nuchal) apophyses of the first five or six vertebræ are almost connected by thin vertical crests or laminæ. The two apophyses of the first of the caudal vertebræ form an arch uniting at the tip into a single apophysis, which is, however, much shorter than the following. The resemblance of the whole to the vertebræ of *M. cephalus*, Cuv., is almost perfect.

When the scales are removed from the top of the head, it is found to be marked with a few pores, and with certain short curvato-linear smooth shining marks or hollows, disposed subsymmetrically.

The individual figured measured twenty inches in length. Fig. I. in the plate is a representation of the under-jaw and the throat, seen from beneath, and showing the commissure of the fore-part of the branchial membrane, with its pores. In most examples the edges of the branchial membrane are even more straight or parallel, as well as more approximate, than in this figure. The corrugated lower part of the upper lip is seen to the left of the dark shaded part or hollow of the mouth. Fig. II. is a view of the top of the head and muzzle from above, the scales having been removed; the upper lip is protruded.





T. 33 — *CECYN didkice*

## TAB. XXIII.

## MUGIL AURATUS, RISSO.

*Tainha de moda*, ou *Muja*.

GILT-CHEEKED GREY MULLET.

CHAR. GEN.; *vide* tab. XXII.

## CHAR. SPEC.

*M. gracilis*, oblongus, dorso recto: labro superiore lævi; dentibus pectinato-setaceis conspicuis distinctis ciliato: maxillaribus rectiusculis, vix flexuosis, tenuibus; extremitatibus (ore clauso) fere expositis, raro omnino celatis: suborbitariis integris, angustis, grosse crenatis: macula operculari utrinque aurea: naribus approximatis: pinna dorsali prima vix altiore quam longa.

$$1^{\text{ma}}. D. 4; 2^{\text{da}}. D. 1 + 8; A. 3 + 9; P. 1 + 17; V. 1 + 5; C. \frac{3 \text{ v. } 4 + \overline{I. + VI.}}{3 \text{ v. } 4 + \overline{I. + VI.}}$$

M. B. 6; Sq. lin. lat. 45 — 47; Vert<sup>æ</sup>. 11 abd. + 13 caud. = 24.

*M. auratus*, Risso, iii. 390. n°. 306.—Cuv. et Val. xi. 43. t. 308, lower figures.

*M. chelo*, Syn. Mad. Fish. (1837), p. 184: nec aliorum.

*M. Maderensis*, Suppl. Mad. Fish. in Proceed. Zool. Soc. 1839, p. 82.—Trans. Zool. Soc. iii. p. 8.

*Myxon*, Rondel. 265.—Will. 276.

*Longit.* 1 — 2 ped. =  $4\frac{1}{2}$  — 6 × alt. = 8 — 9 × lat. = 5 — 6 × longit. cap.

*Tempus*, hieme, vere.

*Locus*, in littore: adultus rarior.

THIS second and rarer Madeiran species of Grey Mullet is at once distinguished from the ordinary rough-lipped sort, no less by its more shapely slender form, and perfectly smooth or even upper lip, than by the more conspicuous or permanent gold or brassy-yellow patch on its opercles. Deceived by M. Cuvier's too broad or unqualified assertion, that in *M. auratus*, Risso, "the maxillary is concealed under the sub-orbitary, as in *M. cephalus*," (R. Anim. ed. 2. ii. 232,) an assertion repeated and expressed more strongly in the "Histoire des Poissons," (vol. xi. pp. 43 and 46,) I have been twice prevented recognizing in this Mediterranean species the true synonym of the Madeiran fish: in which, although the maxillaries are capable of such concealment, and are in fact, especially in adult full-sized fishes, such as that here figured, sometimes quite concealed ("entièrement caché," Cuv. and Val. xi. p. 46) when the mouth is closed, yet just their lower ends or tips more frequently, and especially in young or small examples, remain exposed;



appearing like a little knob or button at each corner of the mouth ; as, in fact, represented in the lower left-hand figure of *M. auratus* in t. 308 of MM. Cuvier and Valenciennes' Histoire. The discovery of this variability of character, not only in the Madeiran fish, but in the Mediterranean *M. auratus*, by the reception of MM. Cuvier and Valenciennes' plate subsequent to that of their 11th volume, when this very discrepancy appeared at once between their figure and description, has led to the correction of an error occasioned by a too strict attention to their text.

These fishes, in their adult state, must, as regards Madeira, be considered very rare comparatively with the rough-lipped sort ; though sometimes there occurs a glut of them. In February, 1835, for the period of a fortnight or three weeks, amidst a gréat profusion daily in the market of this species in its full-sized state, there was scarcely a rough-lipped one to be seen. I have, however, taken it myself, about half-grown, in company with this last-named species, in a sean, upon the beach of the Praya Fernôsa, a little to the west of Funchal, in the month of June. The Funchal fishermen speak of it usually as captured in winter with the common kind, and near the shore, in about two fathoms' water : adding, that it is taken always by a net, and never by the lines. But, in other places, only one sort of "Tainha" or Grey Mullet seems to be recognized. And from the following observations, this smooth-lipped kind would seem more exclusively to haunt the northern than the southern coast.

The shore below the remote village of Porto Moniz, situate near the extreme north-west point of this island, is guarded from the fury of the great Atlantic by an extensive reef of black trachytic rocks of most fantastic shapes and rugged forms ; but for the most part disposed in lines or crests coincident and parallel, or nearly so, with the general outline of the coast, or range of the breakers rolling majestically on it. Between these successive crests or ridges, over which the sea, under the influence of the prevalent north-east trade-winds, for the greater part of the year, bursts with wild and impetuous grandeur, run intermediate deep rifts or channels, of which some are thirty or forty yards wide or more ; abounding in the only sort of Tainha or Grey Mullet with which the fishermen of the neighbouring village profess to be acquainted, and of which they affirm, that full-sized individuals are taken off these very rocks, by a hook baited with the flesh of a small kind of crab, called "Jaca," (*Grapsus varius*, Latr.) in the winter season, whenever the sea is somewhat calm or moderate. At all events, when I was staying some days at this place early in July, for the purpose of examining its fishes and inhaling its pure breezes, whilst feasting eyes and soul upon the grandeur of a view embracing in one wide

majestic sweep the lofty cliffs and iron-bound shores of one half of the north coast of the island, the lesser pools and branches of these channels abounded exclusively with the fry of this species. These were from two to five or six inches long; and, swimming in shoals, were taken by a hoop-net placed in the seaward outlet of the pools or channels. They were not only wonderfully swift and active, but extremely wary, vigilant, and cunning: rushing immediately, upon the slightest disturbance, towards the seaward entrance; which it is therefore necessary to approach and close with haste and caution in the first instance; and then the whole shoal is driven from above, and generally inclosed at once within the net. Amidst a large supply thus taken, there did not occur a single *M. corrugatus*.

On the other hand, at Machico on the south coast, towards the east end of the island, during the two following months, the fry of both species occurred simultaneously\* in about equal proportion and profusion. These were taken indifferently by hook and line, or by a small net worked at night upon the open beach, and for a hundred yards up the river in pure fresh water.

This evidence is merely negative on either hand as to the adult full-sized fish; yet, taken in connexion with its rarity in the market at Funchal, it appears to warrant the conclusion, that the present species has a greater predilection for the north coast than the common Tainha (*M. corrugatus*).

From the various names of "*Cefalo dalla garza d'oro*" (*garza* signifying opercle), "*Cefalo chiaro*" or "*rigato*," "*Muggine ori-frangio*," "*Badigia d'oro*," and "*Musano dull' oro*," which MM. Cuvier and Valenciennes mention as the vernacular names of the *M. auratus* of Risso in different parts of the Mediterranean, this fish appears to be, as in Madeira, perfectly distinguished from the other sorts. Hence it is probably one of the four kinds intended by Rondelet: and, though any peculiar abundance of mucosity is not observable in the Madeiran fish, its straighter back, and shorter or blunter muzzle, would determine, independently of MM. Cuvier and Valenciennes' similar decision with respect to the Mediterranean *M. auratus*, its reference to his *Myxon* rather than to his *Cestreus*; the latter being supposed by MM. Cuvier and Valenciennes to be the *M. saliens* of Risso. Its identity with Aristotle's *μύζων* is even still more problematical. However, as to any difficulty on this head, founded upon Hiccsius' postponement of his *μυζίνος* in point of gastronomic excellence to the *κέφαλος* or *κεστρεὺς*

\* It is not meant to be asserted that the two sorts did not keep in separate shoals. At Magdalená, also on the south coast, five leagues to the west of Funchal, both sorts were taken with a cast-net off the rocks at the same time; but separately, three or four of each together, not intermingled in the same haul.

(Athen. Z. 77. p. 667), whilst by Risso, and the Prince of Musignano, the *M. auratus* is preferred to the more common sorts,—if we may judge from other instances of ancient taste in these matters, there may not after all be much discrepancy between the Greek and modern authors, except in their attaching opposite senses to the terms good and bad eating. In the absence of an opportunity to form a comparative estimate with other species, I can only add, that the Madeiran fish is not appreciably better, although reported by the fishermen to be so, than the common *M. corrugatus*; and, indeed, the two are indistinguishable by the taste. Its fry, abounding on the shore, and in the estuary of the river at Machico, equally with that of *M. corrugatus*, is alike excellent, when fried entire, without removing anything except the scales.

I have never yet been able to detect amidst the multitudes examined of the fry of these two species, varying from four to eight or nine inches in length, any fish clearly answering to the *M. saliens* of Risso; distinguished principally, according to MM. Cuvier and Valenciennes, “parceque son sous-orbitaire a sur le bord antérieur une échancrure bien marquée, dans laquelle est reçu l’angle du maxillaire plié en chevron, et qui laisse voir, même dans l’état de repos, le bout de cet os derrière la commissure.”\* However, from what has gone before, this latter part of the character loses its distinctive value: and the Prince of Musignano seems indeed not to have distinguished this *M. saliens* specifically from the *M. auratus*.†

The Madeiran *M. auratus* will be best described by continual comparison with the common Grey Mullet (*M. corrugatus*) of the island.

It is a more shallow oblong elongated graceful fish in shape; being especially more slender or drawn out towards the setting-on of the caudal fin, which is itself also more spreading, forked, and shapely. The back is altogether lower and straighter, or more horizontal, and much flatter between the top of the head or nape and the first dorsal fin; instead of being convex, and tending to a ridge, as in the common rough-lipped sort: whilst on the other hand the belly is more arched or prominent. The head is smaller, and the muzzle shorter: hence the eye appears set rather forwarder, and it is smaller than in *M. corrugatus*. The space between the eyes is flat, and scarcely exceeds in width twice and a half their diameter. There is a most marked distinction in the upper lip, which is smaller, narrower, and thinner than in the sort just named, and quite smooth and even; wanting entirely the fleshy ridges, plaits, or corrugations on its lower part, which are so remarkable in *M. corrugatus*; and its edge is very distinctly pectinate or ciliated, even in the smallest-sized individuals, by a row of fine soft bristly points or teeth, partly as it were imbedded in its substance. In *M. corrugatus* the upper lip or muzzle is protruded to its full extent by merely drawing down the lower jaw: in *M. auratus* it is not, perhaps, less capable of equal protrusion, but can scarcely in the same way be

\* Cuv. et Val. Hist. xi. p. 47.

† See Cuv. et Val. xi. p. 46, note.

drawn out to its full extent, requiring to be pulled out of itself: hence, on a cursory examination, it appears much less protractile, as it is represented in fig. II. of the accompanying plate. The lower lip and jaw are as in *M. corrugatus*, and there is no appreciable difference about the opercles and interopercles as to shape and size; but the edges of the interopercles, instead of nearly meeting underneath continuously in straight and parallel lines, touch only in one point below the hinder edge of the eye; receding mutually forwards, and then again meeting at the tip of the jaw, so as to include a wide distinct elliptic space; with only one or two obscure, instead of five or six distinct pores on each side the symphysis in front.

The mouth is much less strong in all its parts than in the common Grey Mullet of Madeira. The suborbitaries are narrower and weaker, yet much more coarsely crenulate at their obliquely truncate ends: their front margin is generally perfectly straight and even; but sometimes, in adult fishes, faintly waved or sinuate.\* The maxillaries are much finer or more slender, and straighter; scarcely at all twisted, and with their lower ends not sensibly recurved: when the mouth is closed, these ends most frequently remain exposed, like little knobs or buttons, just below and obliquely behind the corners of the mouth; but occasionally, both in young and full-grown fishes, they are quite concealed beneath the edge of the suborbitaly.† The palatines far back, in adult fishes, feel slightly rough, or scobinate, with a few minute teeth; but the vomer, with all the rest of the roof of the mouth, and the tongue, are quite smooth, though appearing often in young fishes granulose or pustulose. The tongue has a raised ridge or keel down the middle, fitting into a corresponding hollow in the palate. This ridge is neither particularly sharp, nor the palatal groove for its reception deep.‡

The eye, except in being rather smaller, and having the top of the eyeball not so black or dark-coloured, resembles that of *M. corrugatus*; having the orbit, especially in front, gelatinous, but without any particular obducted veil or eyelid.

The nostrils are close together, but considerably forwarder, or farther from the eye, than in the common rough-lipped Grey Mullet; and, in adult fishes, the anterior round orifice has frequently a beautiful bright lilac-coloured lining, projecting a little, like a funnel. In *M. corrugatus* there is the same funnel-like projection; but the lining is dusky or plain-coloured, and the orifice is not so exactly circular.

The fins, as to their shape and position, resemble generally those of *M. corrugatus*: but they are altogether more pointed, slender or elegant, and shapely; especially the pectoral, the ventral, and the forks of the caudal fin. The pectoral fins, indeed, are considerably longer, and inclining to lanceolate: being contained only from five to six times, instead of seven, in the whole length of the fish. The first dorsal fin is lower and more triangular; its height but little exceeding the length of its base, and being contained from twice to twice and a half in the depth of the body below it. The three first spines are of gradually decreasing length; and the fourth, though much weaker, is not dispropor-

\* I find nothing about the suborbitaly, either in the present fish, or in *M. corrugatus*, answering to MM. Cuvier and Valenciennes' expression (Hist. xi. 43) "relevé d'une arête." It appears to me quite flat or simple. See *M. breviceps*, Cuv. et Val. xi. 106.

† A large majority in young examples has them exposed. Of five full-grown fishes, three had them exposed; which was the case also with a sixth half-grown example.

‡ Confer *M. fulcipinnis*, Cuv. et Val. xi. 105.—It would seem questionable, whether either *M. breviceps*, or *M. fulcipinnis*, Cuv. et Val., is really distinct from at least the Madeiran *M. auratus*.



tionately shorter, whilst the web, by which it is connected to the back behind, is usually entire. The acuminate scaly laminae, or appendages, at each side the base of this fin, and at the upper axil of the ventral fins, resemble those of *M. corrugatus*, but are broader, less acuminate, and not quite so long; those belonging to the dorsal fin not reaching nearly to the end of its base, or little more than halfway from the base to the tip of its fourth spine when reclined. The second dorsal and the anal fins are set on forwarder, or further from the root of the caudal fin, than in *M. corrugatus*.

The scales are large, and in general, perhaps, more rounded than in *M. corrugatus*; but clothing the head, opercles, body, and fins, precisely in the same manner. Several above the upper axil of the pectoral fins are more pointed than the rest; but not larger, or otherwise peculiar. On their removal from the top of the head or nape, it is found to be marked, much in the same way as in *M. corrugatus*, with curvato-linear scars, or hollows, placed somewhat symmetrically. The second and third spines of the first dorsal fin are scaly alternately on opposite sides. The second dorsal, anal, and caudal fins are scaly at the base; and the latter especially is scaled a long way up between the rays in imbricated silver rows.

The general tint, especially of the fins, is paler and browner than in *M. corrugatus*; and the scales have no dark border or crescent. Of the six or eight longitudinal stripes along the sides, the lowest four or five are brown, not black; and the pure pearly or milk white of the belly reaches higher up the sides. The top of the head, nape, and back, is dark grey rather than black. But from its earliest stage to its full size, this fish is permanently characterized by a large spreading conspicuous brassy or golden patch on the opercle or cheeks behind the eye; reflecting beautiful metallic iridescent tints, and not, as in *M. corrugatus*, evanescent.

The edge of the lips, particularly of the lower, is rose or flesh colour. The inside of the mouth is white, tinged with lilac. The iris is at first dark coppery or golden brown, with the inner edge next the pupil light or pale brassy; in less fresh examples it is beautifully clouded with lilac, passing into blue and red, mixed with a little golden, on a pearly ground.

Fins in general pale brown (drab), especially the pectorals: the caudal bluish-grey, with silver rows of scales between the rays. The hind parts of the anal fin, and whole of the ventral fins, are white. The web of the first dorsal fin is pellucid, the spines are dusky brown.

In the dissection of a female individual, which measured two feet three inches in length, and weighed five pounds and three quarters, taken in the middle of March, the peritoneum was observed to be brown, speckled with black: in small examples it is generally altogether coal-black. There were six or seven very large and thick, but short conical cæca. The air-bladder was very large, lanceolate, pointed behind, simply obtuse or truncate forwards, and attached completely to the spinal column. The ovaries were empty.

In another female, two feet two inches long, taken at the end of May, the liver was observed to be pale and large; the gall-bladder large, but with a short duct, not reaching beyond the lobes of the liver; the intestine large and voluminous, as in *M. corrugatus*, and of the same green or brown colour; the stomach hard, bulbiform or clavate forwards, like a gizzard; the ovaria long and cylindric, filled only with a grumose jelly; the air-bladder as before. There were eight cæca.

In a third full-grown female, taken in the beginning of October, measuring two feet three inches and a half in length, and weighing nearly seven pounds, the ovaries were full of small but well-formed eggs. There were nine cæca; the



peritoneum was speckled with black; and the abdominal and caudal vertebræ were equal in number, or twelve each. It proved a very old fish, with the bones quite cellular or almost carious. The gold patch on the opercles was diffuse and rather faint; the maxillaries were quite straight, and in this example entirely concealed when the mouth was closed. The hinder part of the preopercles exhibited three hollow smooth white scars or grooves between the scales, of different lengths, and running backwards to the edge, which thus appeared excised, or three-notched, as in Dr. Rüppell's *M. macrolepidotus* (Atlas zu der Reise, 140. t. xxxv. f. 2 a). I am ignorant at present whether this is a constant character in the Madeiran fish, having only recently observed it.

The vertebræ do not differ appreciably from those of *M. corrugatus*.

The parallel longitudinal lines or striæ on the anterior or basilar triangular compartment of the scales in this fish vary from zero to ten in different parts of the body.

The top of the head and nape in large fishes resembles strongly that of a snake or lizard.

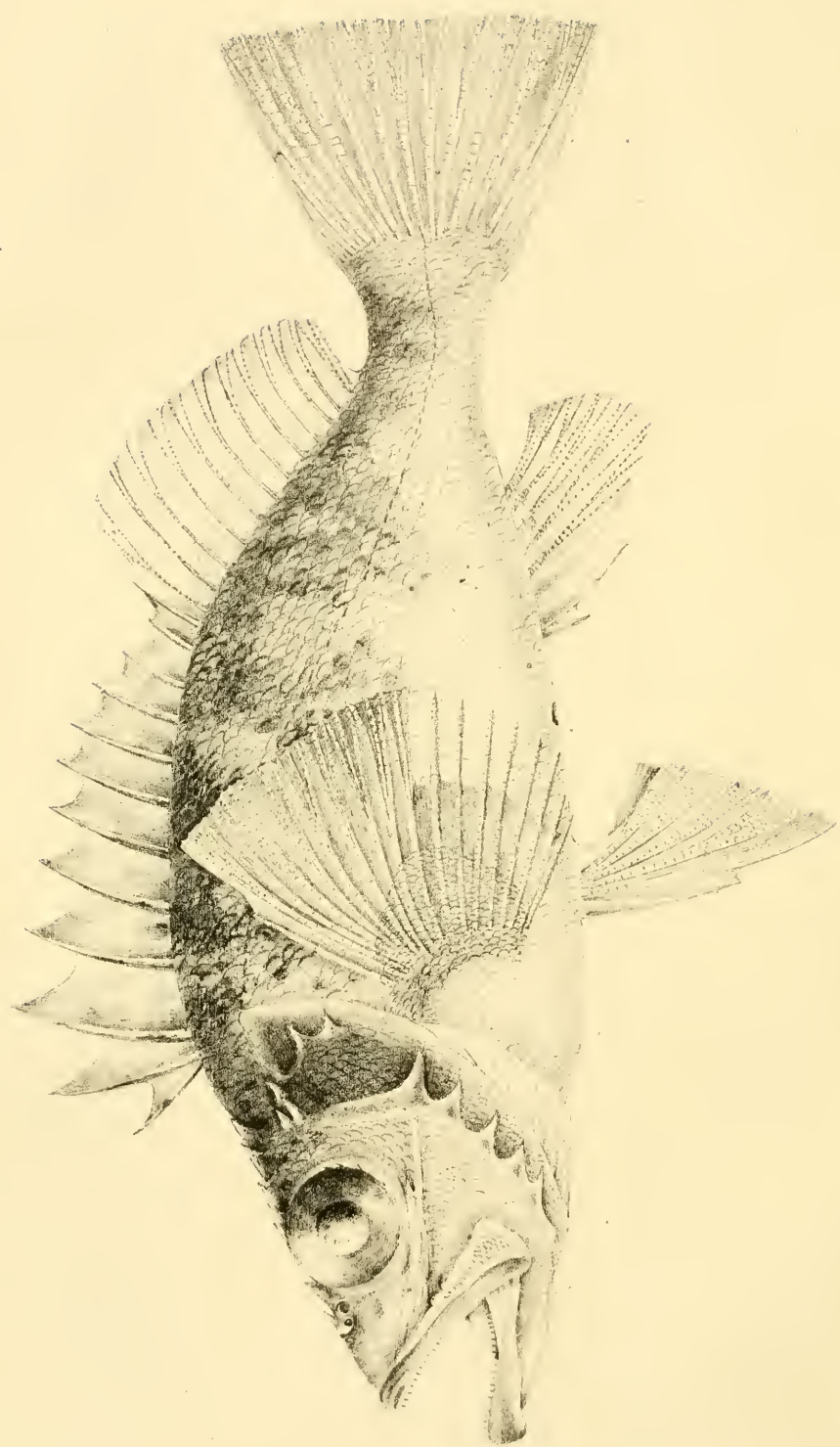
The example figured, taken in the middle of February, was twenty inches and a half long; and its greatest depth and thickness at the first dorsal fin were respectively four and a half and two and a half inches.

Figure I. is a view of the under jaw and throat from beneath.

Figure II. is a view of the top of the head, with the muzzle protruded, as above explained.







## TAB. XXIV.

## SEBASTES IMPERIALIS, CUV.

*Boca negra, or Pai de Gato.*

THE CAT'S-EYE, OR BLACK-MOUTHED HOG-FISH.

CHAR. GEN. ; *vide supra*, tab. XVII.

## CHAR. SPEC.

*S. suboblongus*, laciniis nullis, ruber ; corpore fasciis subquinis latis dorsalibus, perpendiculatis, saturatoribus, fusco nebulosis ; operculo gulaque intus nigricante : rostro breviusculo, acuto : suborbitario antice subsinuato, obsolete bidentato ; carina subocularia subinermi : præoperculi spinis subæqualibus, validis, horizonti subparallelis : pinnarum pectoralium axilla inermi, radiis octo inferioribus simplicibus ; dorsalis parte posteriore basi maxillaribusque squamatis.

D. 12 + 12 ; A. 3 + 5 ; P. 2 + IX. + 8 ; V. 1 + 5 ; C.  $\frac{7 \text{ v. } 8 + \text{VI.}}{5 - 7 + \text{V.}}$

M. B. 7 ; Sq. lin. lat. 29 v. 30 ; Vertæ. 10 abd. + 15 caud. = 25.

*S. imperialis*, Cuv. R. An. ii. 167.—Cuv. and Val. iv. 336.—Syn. Fish. Mal. p. 175.

*Scorpena dactyloptera*, (Laroche) Risso, iii. 359.

“ ——— *Malabarica*, Bloch,” fide Cuv. and Val. l. c. 340.

*Longit.* = 10 — 15 poll. =  $3\frac{1}{2} \times$  alt.

*Tempus*, vere, autumnno ; sed per totum fere annum.

*Locus*, in rupibus profundissimis : rara.

CUVIER has expressly stated,\* that he derived the generic name *Sebastes* from the Greek form (σεβαστὸς) of the Majorcan epithet *imperial*, by which this particular species of the genus is distinguished at Iviça. His writing it *Sebastes*, instead of *Sebastus* in conformity with the established form of termination in the Latin tongue for all words ending like σεβαστὸς in the Greek, is however perfectly defensible, if it be considered as immediately or independently derived from σεβά-ζομαι.

It seems extraordinary† that so distinct and remarkable a species should have escaped the notice of all the older Mediterranean ichthyologists of the sixteenth and seventeenth centuries ; being, as M. Risso

\* Cuv. and Val. Hist. iv. p. 327.

† The solution suggested by MM. Cuv. and Val. that it was possibly confounded with the *Cottus Massiliensis* of Forskål (*Scorpena porcus*, L.) or with the *Perca marina* of authors, does not apply to Rondelet, Salviani, and Willughby, &c.



asserts, a very common fish at Nice; and, according to MM. Cuvier and Valenciennes, not rare in any part of the Mediterranean. M. de Laroche, who first observed it at Ivica early in the present century, speaks of it, however, according to MM. Cuvier and Valenciennes, as very rare wherever fishing is not carried on at great depths: and though this last condition can be scarcely anywhere more perfectly fulfilled than in Madeira, this fish, though generally well known by the fishermen, is certainly of but occasional and somewhat rare occurrence; and that principally in the spring and autumn. Its breeding season I have only negatively ascertained to be at neither of these periods: which serves, however, to confirm M. Risso's observation, corroborated by the analogy of its cognate species, that the female is in spawn in summer.

From its rarity, the *Boca negra* is but as it were by accident brought to the table. Its flesh is much inferior in quality to that of even the *Carneiro*; being generally both insipid and soft, without being flaky.

Besides the name of *Serran imperial*, by which Laroche informs us that this fish is designated in Majorca, he also mentions that at Barcelona it is called *Panegal*. At Nice, Risso relates that it is called *Cardou-niero*; in probable allusion to its spines. Its Madeiran name of *Boca negra*, or Black-mouth, is highly characteristic: that of *Pai de Gato*, or, perhaps, more properly *Pai de Gatas*, seems equivalent to Tom-cat in the English idiom; and, according to the fishermen, is given in allusion to the eyes, which glisten strongly in the dark.

In a list of the popular names of fishes in Teneriffe, I find a "*Bocinero*," which is perhaps this fish. But proper evidence is wanting to establish its existence further south: Bloch's references of his *Scorpena Malabarica* to the coasts alike of Coromandel and of South America being, as MM. Cuv. and Val. justly observe, equally suspicious.

The black mouth serves immediately to distinguish the subject of this chapter from the *Requeime* and *Rocaz*, with which it is generically allied; and the entire absence of laciniae on the head or body serves further to prevent its being taken for a large state of the latter fish, to which it has in coloured markings some resemblance. From the *Carneiro* it is further distinguished by the generic character of the scaly head.

The shape of *Boca negra* is like that of the *Requeime*, though the back is usually less gibbous at the nape, in which case it approaches more to the form of the *Carneiro*. The greatest depth at the nape or shoulders is contained about three and a half times in the whole length: and the thickness, which is greatest behind the eyes, is about half the depth. The length of the head is one third of that of the whole fish: and the diameter of the eyes is contained from rather more than three to not quite four times in the length of the head; they are very

large, but, like those of the *Requeime*, do not project above the profile. The space between them is very deep and strongly ribbed, but narrow; scarcely in width equalling half their diameter.

The head is altogether less conspicuously armed and more distinctly scaled than in the *Requeime*, with the eyes much larger. The muzzle is much shorter, scarcely equalling in length the diameter of the eye; but still pointed and compressed, and with the hump before the nostrils altogether obsolete. The longitudinal suborbital ridge beneath the eyes is less prominent, and scarcely at all, or very feebly and inconspicuously, aculeate; with generally only one slight spine: and the two spines of the fore suborbital over the maxillary, which are so conspicuous in the *Requeime*, are reduced to two obsolete small teeth or angles, the anterior or uppermost of which is the largest. The marginal spines of the preopercle on the other hand are very large, distinct, equidistant, and nearly equal; with the uppermost but one, however, largest: all having the same horizontal or parallel direction; being nearly straight, or but slightly hooking upwards. The scapular and the two supercapular spines are small and crowded; forming the usual triangle. There is no humeral spine or bone externally discernible; but merely a triangular loose scaly skin in the upper axil of the pectoral fins. The disposition of the other spines is similar to that of the *Requeime*: but they are generally much smaller and more inconspicuous; and those immediately behind the eyes (of the posterior frontal bones), together with the strong one in the *Carneiro* and *Requeime* between these and the two supercapular spines, are quite obsolete or wanting. The spines above the nostrils and orbits, and the pair at the nape, are precisely similar to those of the *Requeime*; but instead of being more conspicuous in large examples, as in that fish, they become more obsolete in full-grown individuals.

As in the *Requeime*, I have observed sometimes about the muzzle other pores or orifices, besides the two usual nostrils on each side: and the lower jaw has the same sort of tubercle at its tip beneath.

The pectoral fins are even broader and larger than in the *Requeime*, covering, when expanded, the whole depth of the side, and they are more abruptly truncate. The two first rays are barred, but simple: the last eight only are fleshy, simple, thickly barred or annulate, and with the connecting web reaching only halfway up; their ends being free:\* the nine intermediate rays are branched, with merely their tips free.

The ventral fins resemble those of the *Requeime*. They are a little shorter than the pectoral fins.

The anterior portion of the dorsal fin resembles rather that of the *Carneiro*: the three or four first spines being even less unequal than in that fish. The hinder soft-rayed portion having three more rays, is longer and more oblong: and its last forked or double ray is merely connectea by a short web in its axil to the back, instead of in its whole length.

The anal fin in size and position is like that of the *Requeime*, but is more abrupt or truncate. The vent is situate considerably before it; and its last ray is forked, and altogether free from web behind.

The caudal fin is simple, and completely truncate.

The head is perhaps somewhat more conspicuously scaled than in the *Requeime*; the scales advance rather forwarder under the eyes, and there is an evident band or triangular patch of them on the ends of the maxillaries. However, the muzzle and the lower jaw are naked, like the borders of the maxillaries. The scales of the body advance quite up to the point of the throat, and end in two

\* Like fingers: whence Laroche's name, "*ductyloptera*," finger-finned.

slightly convex lunules or arches at the base of the caudal fin. The scales are rough or ciliate, and larger than in the *Requeime*, but smaller than in the *Carneiro*; and in their disposition resembling the former. The spiny portions both of the dorsal and the anal fins are naked; but the hinder soft-rayed parts of both are scaly at the base between the rays: the former for one third, the latter for one fourth of its height. The pectoral fin has also a rather high and convex arch of scales covering its base.

I have been unable to discover any trace of laciniae on any part of either the head or body. Each spine, however, of the dorsal fin is tipped with a short filament.

The lateral line is nearly straight, as in the *Requeime*; and consists of twenty-nine or thirty scales, each marked, as in that fish, with a little spine-like point directed towards the tail. The first two or three of these points are strong and pungent, resembling the scapular spine, from which they commence. The hinder scales appear composed of a small one, free behind, fixed upon a larger by its anterior edge or portion.

The general tint of this fish is usually a paler scarlet than in its allies; the ground being a pale flesh-colour. On this are disposed five darker or brighter scarlet irregular broad bands, often mottled or suffused with dusky, running down the sides from the dorsal ridge, and disappearing on their middle. The first and smallest of these is at the origin, the fourth at the end of the dorsal fin; and the fifth at the root of the caudal. All the fins are scarlet and without any spots or bars: but the spiny part of the dorsal fin is mottled, the points of its spines and filaments are tipped, and its soft part, like the front of the ventral and anal fins, is edged with white. The head is bright scarlet; the opercle clouded by a suffused large patch of leaden or pale violet-black, caused by the shining through of the lining of the gill-opening, which is deep mulberry-black. The back part of the mouth or palate, as of the tongue, together with the gullet, is of a more or less deep lead-colour, approaching to black: the front of the mouth and tongue being pale or whitish. The iris is golden or topaz, shaded with brown; and the pupil has a violet or bluish opaline, not brassy, lustre.

In several examples from twelve to fourteen inches long, captured in August, the colour, whilst the fish was yet alive, was of the most brilliant scarlet imaginable, with the bands deeper, but pure intense scarlet. The eye was singularly beautiful. The anal fin was broadly edged in front with white.

On opening the abdomen, the whole peritoneum, like the lining of the branchial and thoracic cavities, is found to be of the same intense shining inky or mulberry-black. There is no air-bladder. The liver is large and pale. There are from five to seven cæca: Laroche found six; MM. Cuvier and Valenciennes five in their example; I have generally observed six or seven of moderate size and length. They are in general loaded and coadmate with fat.

The whole number of vertebræ is assuredly only twenty-five,\* including that, as usual, from which originates the caudal bony fan. Of the ten abdominal vertebræ, the first is neither ossified nor bent at an angle with the skull, as in the *Sebastes Kuhlîi*; but is articulated to it in a straight line by a flexible soft cartilage as usual, and differs not in length from the next vertebræ: the five last are furnished with broad and strong apophyses beneath, of which the three last pair unite into a single strong bone, forked or notched only at the tip, and

\* In one or two instances the vertebræ were 10 abd. + 14 caud. = 24; the deficiency being in the caudal vertebræ: but twenty-five is the number in the great majority. However thus, in any case, this fish has one *abdominal* vertebra more than either the *Requeime* or *Rocaz*; and *normally* one more on the *whole*.

winged or dilated behind ; but not so remarkably as in the *Requeime*. The first caudal vertebra is only indicated by its simple lower apophysis, not notched at the tip.

The figure is taken from an example measuring about half an inch more than a foot in length. The largest I have ever seen was fifteen inches long, and weighed two pounds. The anterior suborbitary, from an individual fourteen inches long, will be found figured in tab. xxv.—at f. 3.

This fish is only captured in Madeira, as in other places, at enormous depths, viz. from eight or nine to fourteen *linhas*, and off rocky bottoms. It is taken at all seasons ; though chiefly in the spring and autumn, and only occasionally at any period.









T. 25. M. Y. del & fec.

## TAB. XXV.

## SEBASTES MADERENSIS, NOB.

*Rocaz, ou Papa-Jaca.*

LITTLE ROCK-FISH, OR SUCK-JACK.

CHAR. GEN.; *vide supra*, tab. XVII.

## CHAR. SPEC.

*S. oblongus*, laciniatus, pallide olivaceus, fusco marmoratus vel 3 — 4-fasciatus, rubroque alboque irrorato-variegatus: capite latissimo, magno, aculeatissimo: rostro abbreviato, obtuso: suborbitario antice spina unica valida: carina subocularia postice aculeata: spinis præoperculi inæqualibus, superioribus majoribus: pinnarum pectoralium axilla spina humerali valida, hinc infra apicem dente aucta; radiis decem inferioribus simplicibus, ramosis paucis: dorsalis spina quarta ceteris longiore analisque parte posterioré basi squamatis.

D. 12 + 10; A. 3 + 5; P. 1 + IV. v. V. + 10 v. 9 = 15; V. 1 + 5; C.  $\frac{4 + VI.}{3 + V.}$

B. M. 7; Sq. lin. lat. 28 — 30; Vertæ. 9 abd. + 15 caud. = 24.

*S. Maderensis*, Syn. Fish. Mad. p. 175.

*Scorpena Madurensis*, Cuv. and Val. 9. 463.

*Longit.* = 4 — 6 poll. =  $3\frac{1}{2} \times$  alt.

*Tempus*, per totum annum.

*Locus*, in rupibus littoralibus: vulg.

THIS elegant and well-marked little species of *Sebastes* abounds close off the rocky reefs and islets of the coast on all sides of the island; and is a frequent inmate of the numerous pools, or natural rock-basins, left by the receding tide amidst the crevices and hollows of the rude trachytic or basaltic masses, which, on these iron-bound shores, guard from the further inroads of the waves the lofty cliffs of which they often are the partial ruins. Here, in association with the rainbow-like *Julis Turcica* and *unimaculata*, the more subdued in tint, but not less beautifully varied tortoiseshell-like livery of this little Rockfish, forms an agreeable contrast with the splendid gem-like brilliancy of these *Labridæ*, and with the sober-tinted plainness of the Blennies, which divide with them the empire of these microcosms of the ocean's animal and vegetable stores. Thus, in Madeira, this little *Sebastes* in locality and habits

occupies the place precisely, which its allies, the Father-lasher (*Cottus bubalis*, Euphr.) and Sea-scorpion (*Cottus scorpius*, Bl.), fill on our British shores. It appears, however, more strictly confined to the immediate neighbourhood of rocks than either of these European species; for I have never seen it taken in a net worked upon any sort of beach. It is, indeed, merely caught by boys for their amusement; biting readily at a hook baited with a crushed Periwinkle, Trochus, or Limpet; and is not often used for food. Its second Portuguese name of "Papa-Jaca," or Suck-Jack, it has earned by its troublesome addiction to hooks baited with the little crab called "Jaca" (*Grapsus varius*, Latr.); and hence, although its teeth appear ill-suited for the purpose, and that it also may be captured with a fish-bait, its more favourite food plainly consists of the hard-shelled molluscous or crustaceous animals.

In differing from authority so high as that of MM. Cuvier and Valenciennes regarding the generic allocation of this fish, I do but follow the example which these authors have themselves afforded in the case of a nearly allied species of the Indian Archipelago, their *Seb. minutus*, Hist. iv. 348, in considering the presence of true scales upon the head, opercles, and cheeks, decisive of the question. Indeed this character affords the only safe and practically useful mark of distinction between *Scorpena* and *Sebastes*. A greater degree of armour, and a redundancy of the fleshy laciniae, might at first appear to favour MM. Cuvier and Valenciennes' position of the Madeiran fish; especially if the two genera were compared only in their respective types, *Scorpena Scrofa*, L., and *Sebastes novegius*, or *imperialis*, Cuvier: but when we take a wider view, these characters are found to be subordinate; as these authors have themselves virtually acknowledged, by placing in *Sebastes* their own species, *S. minutus*, and *S. Bougainvillii*. I might refer, in further illustration of this view, to the Madeiran *Sebastes Kuhlii*, t. xvii.; which, with the head almost as distinctly scaly as in the typical *Seb. imperialis*, Cuv., has it even more conspicuously armed than in *Scorpena Scrofa*, L.: whilst, on the other hand, we find placed in *Scorpena* a fish (*Sc. inermis*, Cuv. and Val.), of which it is remarked "que les épines et les crêtes de sa tête, d'ailleurs les mêmes en nombre que dans le *Scrofa* ou le *Porcus*, sont tellement effacées, qu'il faut de l'attention pour les remarquer."\* And as to fleshy laciniae, it has "très-peu sur le corps, et aucuns sur la tête:" whilst in *Sc. porcus* they are also "infiniment moins nombreux" than in *Sc. Scrofa* on the head; there are absolutely none upon the sides of the body; and "scarcely any, and those very small, on the lateral line." Hence I think it will sufficiently appear, that in resting mainly the distinctions between the

\* Cuv. and Val. iv. 311.

genera *Scorpena* and *Sebastes* on the naked, or obviously scaled head, and in placing in the latter genus MM. Cuvier and Valenciennes' *Scorpena Madurensis* (*Madeirensis*), I have merely followed out these authors' general rule of practice in other cases.

If, however, in *Seb. Maderensis* the aspect, width, and armour of the head, projecting eyes, and the more copious laciniae, remind one of *Scorpena Scrofa*, L., there are other characters, besides the scaly head, which indicate as great a tendency at least towards the typical *Sebasteæ*. Such are the small size and disposition of the scales, their presence on the hinder portions of the dorsal and anal fins, the form, and the single large deflexed spine or tooth at the lower angle of the first suborbital, which is otherwise entire, plain, and without the radiating ribs, ending on the fore-edge in two diverging pairs of spines, of the *Scorpena Scrofa*, L.; and, lastly, in its strongly gibbous back. The humeral spine is even much larger than in *Seb. Kuhlii*: and the colours evidently approximate to those of *Seb. imperialis*. Hence, in subordinate characters alone, the balance of affinity inclines upon the whole from *Scorpena* to *Sebastes*.

The general form and proportions of this little fish are rather those of *Seb. imperialis* than of *Seb. Kuhlii*: but it is generally more gibbous than the former, close behind the nape; larger examples being still more strongly so than smaller individuals. In one such of six inches long, in consequence of the great prominence of the dorsal hump, the length only contained the depth three times: in smaller individuals it approaches near to four times the same quantity. The greatest thickness from the eyes to the nape exceeds half the depth; and the length of the head again a little exceeds the greatest depth. The diameter of the eyes is generally one fourth that of the length of the head, but in large individuals only one third and a half of the same. Hence the eye is as large as in *Seb. imperialis*; whilst in its prominence above the profile it resembles rather the *Scorpena Scrofa*. This latter character is not, however, nearly so much developed as in that fish. The space between the eyes is very deep and channelled, but narrow; only equalling in width the semidiameter of the eyes. The edges of the orbits are raised and prominent.

The head in size and degree of armour most resembles the *Sebastes Kuhlii*; whilst in breadth and shortness of the muzzle it is most like the *Scorpena Scrofa*. The mouth and gape are enormously wide, and like a frog's. The muzzle is broad, short, and very abrupt or obtuse, equalling in length the eye's diameter; generally arched and convex rather than having any distinct or decided hump.

The number and the general disposition of the spines are perfectly according to the usual Scorpenid model: but the suborbital is quite entire and merely notched in the middle, with the lower angle produced downwards into a single distinct large flattened tooth, rather than spine, lying parallel with the border of the maxillary; and the longitudinal ridge or keel across the cheeks, beneath the eye, is aculeate only towards its hinder end, or behind the eye, with three or four well-marked spines behind each other; the last of these, a very large spine, being the uppermost and strongest of the five usual preopercular spines, which increase in size from the lowest upwards: the lowest being so inconspicuous that I had formerly overlooked it altogether. There is the usual erect spine above the nostrils; the single one over the anterior, and the three together, one behind



another, over the posterior canthus of the eye; and then again after a little interval, still backwarder, the two together on the pape; all being recurved, and the five last acute. Immediately behind the middle of the eye, on the posterior frontal bone, there is, as in *Scorpena Scrofa*, a rather strong spine: and behind this again, another, halfway towards the lower, and rather stronger, of the two small supescapular spines. The scapular spine, forming the apex of the triangle of which these latter are the base, is again a little stronger and more conspicuous: and in the upper axil of the pectoral fins there is a remarkably conspicuous strong oblique flat spine, belonging to the humeral, which is as it were doubled by the addition of a side-tooth on its upper edge.

The lower jaw is not longer than the upper, and has the usual callous tubercle at its tip beneath.

The pectoral fins are large and broad, but rounded and not truncate; most resembling those of *Seb. Kuhlîi* in shape and proportion, but still more those of *Anthias formosus*, Bl., in having also merely the points of the lower fleshy simple rays free. The first ray, and now and then the second also, is simple; the next two to six are branched; the lowest eleven to eight simple: the whole number of rays remaining generally constant at fifteen, but sometimes being sixteen. Hence, notwithstanding their variableness in number, the fewness of the branched rays in these fins is characteristic of the species; evincing also an approximation to *Sebastes Kuhlîi*.

The ventral fins are large, and as long as the pectoral. They are rounded at the tips; and their last ray is webbed by nearly its whole length to the body.

The anal fin is rather larger in proportion than in the other Scorpenoid fishes before described; but differs not in shape or structure. Its last ray is quite free behind, or with merely a slight inconspicuous web quite in the axil. The vent is situated nearly halfway between the origin of the anal and the root of the ventral fins.

The only peculiarity of structure in the dorsal fin compared with that of *Scorpena Scrofa*, is, that the fourth spine is longest, being rather longer than the third. Hence the whole anterior portion of this fin has a more regularly arched or rounded outline. Behind the tip of each spine the membrane forms a rudimentary point or lacinia. The last soft ray is webbed completely to the back.

The caudal fin is simple, and fan-shaped rather than truncate.

The scales, from the small size of the fish, appear much smaller than they really are; for in their proportion they are the size of those of *Seb. imperialis*, which they resemble also in their disposition. They are not less distinct or conspicuous on the head and opercles than in the Requeime (*Seb. Kuhlîi*); and advance forwards on the cheeks in a narrow band, beneath the suborbitary ridge, quite to the anterior canthus of the eyes: but the maxillaries are perfectly naked and smooth. The top of the head and muzzle is rough or furfuraceous, but not distinctly scaled. The whole of the lower jaw is naked. The breast, and fleshy base of the pectoral fins, are minutely but distinctly scaled quite up to the point of the throat; but the pectoral fins themselves are wholly naked.

The soft portions both of the dorsal and the anal fins are minutely scaled a little way up at their base; but their spiny parts, like all the other fins, are quite naked.

Out of the water, at first sight, or on cursory observation, this fish appears to be devoid of membranous laciniae: but, on close examination, it is found to be furnished very copiously with them on the head and shoulders; which, when the fish is alive in the water, appear quite mossy with them. There is a larger, stalked, and toothed, or dilatato-lacerate one at the tip of the muzzle, on each side

of the upper jaw in front; another rather large one at the hinder edge of each fore nostril; and a similar one behind the last of the five orbital spines: the edge of the preopercle and suborbital is fringed with similar but very short laciniae. The orbit, or eyebrow, is copiously fringed with short and simple ones, like filaments: and the broad ends of the maxillaries have a single longer one of the same kind; of which there are also two or three, ranging backwards in a row, along the branches of the lower jaw, beginning from their symphysis behind the lip. Of these the front ones form a large conspicuous pair; being, while the fish is alive and in the water, stretched constantly straight forwards, like two horns, beneath the chin, and reaching beyond its edge. The body is usually unfurnished, even on the lateral line, with either of these kinds: but the flanks, together with the base and upper axils of the pectoral fins, are copiously furnished with little triangular flap-like laciniae of a brilliant white; in some parts one almost to each scale; whilst the rest of the sides, the lateral line, and branchial membrane, are more thinly sprinkled with the same. Towards the tail these disappear.

The lateral line is nearly straight, as usual; and consists of from twenty-eight to thirty scales, each marked with an adpressed spine-like point, especially towards its origin.

In the general disposition of its colouring, this fish most resembles the *Sebastes imperialis*, Cuv. The ground-colour of the sides is a pale horn, or olivaceous ochre-yellow, marbled with large irregular distinct dark patches of rich brown; descending from the back, and forming three distinct broad wavy bands behind the middle, reaching quite down to the ventral line: the first of them covering the front also of the soft hinder portion of the dorsal fin; the second passing like a bar across the fleshy root, and the third across the middle of the caudal fin; the tip of which shows traces of a fourth. The back, forwarder, is like the head dusky, and irregularly mottled with darker brown. The belly and breast are pale and immaculate. The whole is variegated with dots and touches of clear white and scarlet, or vermilion. The cheeks are spotted with brown. The lower jaw, throat, and branchial membrane are most beautifully freckled or mottled with rose-colour and white. The lips are clear yellow, or tawny-yellow (fulvous). The inside of the mouth, tongue, and gullet are white and immaculate; pale flesh-colour only towards the front. The iris is golden, nearly covered with large rich brown patches and some garnet-red.

The spiny part of the dorsal fin is mottled like tortoiseshell with rich tawny-yellow, white, and dark brown. The fore-part of the soft-rayed portion is covered by the first of the three bands, having the tips of the rays bright red or rose. The anal fin is less mottled, with the tip bright red or rose-colour. The ventral fins are deep rosy-red, immaculate. The rays of the pectoral fins are barred with dark brown, red, and white; the tips of the lower fleshy rays being rose. The caudal fin, with a broad dark brown band in the middle, is also tipped with the same colour, and with rose-red.

These are the usual colours shortly after death. Whilst alive and in the water, it has a different aspect: so closely imitative of the coral-incrusted rocky shelves and sunny shallows upon which it loves to bask, that the eye fails often to discern it; and, even in a shallow pool of only two or three feet in diameter, may search for it some time without discovery. Under these conditions, it exhibits less of red or rosy, and more of a richly mottled tortoiseshell or brown, of varying shades and intensity, freckled, like the flower of a *Stapelia*, with light and dark, drab and coffee-colour: the whole being thickly speckled with clear white, and with here and there a little red; the white specks being chiefly the short flap-like laciniae. After death the red, deep rose, or scarlet gradually more and more

prevails; and in some few examples, during summer, it is very brilliant and predominant, even whilst the fish is still alive.

On dissection, the liver is found to be large, and very pale in colour: the gall-bladder large: the stomach rather long and cylindric, with the pylorus or ascending branch lateral, and furnished with five distinct and nearly equal caeca, disposed palmately or like the fingers of a glove, but in two sets, of three and two each; the former on the right or upper side; the latter on the left or lower, and with the outermost of the two the longest. The intestine is very large in diameter, and makes two bends or one short volution. There is no air-bladder. Sometimes, but rarely, there are six cæca, in two sets of four and two.

The four last only of the nine abdominal vertebræ are furnished with apophyses beneath: and of these the three last are united nearly to their tips into single processes, strongly winged behind, and forked, or notched, only at their tip. The first two caudal vertebræ are similarly winged behind, but not notched. The point of the first interspinal of the anal fin, which is both very long and strong, being formed of the interspinals of the two first spines of the fin, united longitudinally into one, is inserted into the notch of the last (ninth) abdominal inferior apophysis.

The figure is the size of life: being taken from an individual of the more usually occurring length. The largest example which has occurred measured only six inches.

*f. 1.* represents the anterior and second suborbitaly in *Sebastes Maderensis*, from an example four inches long.

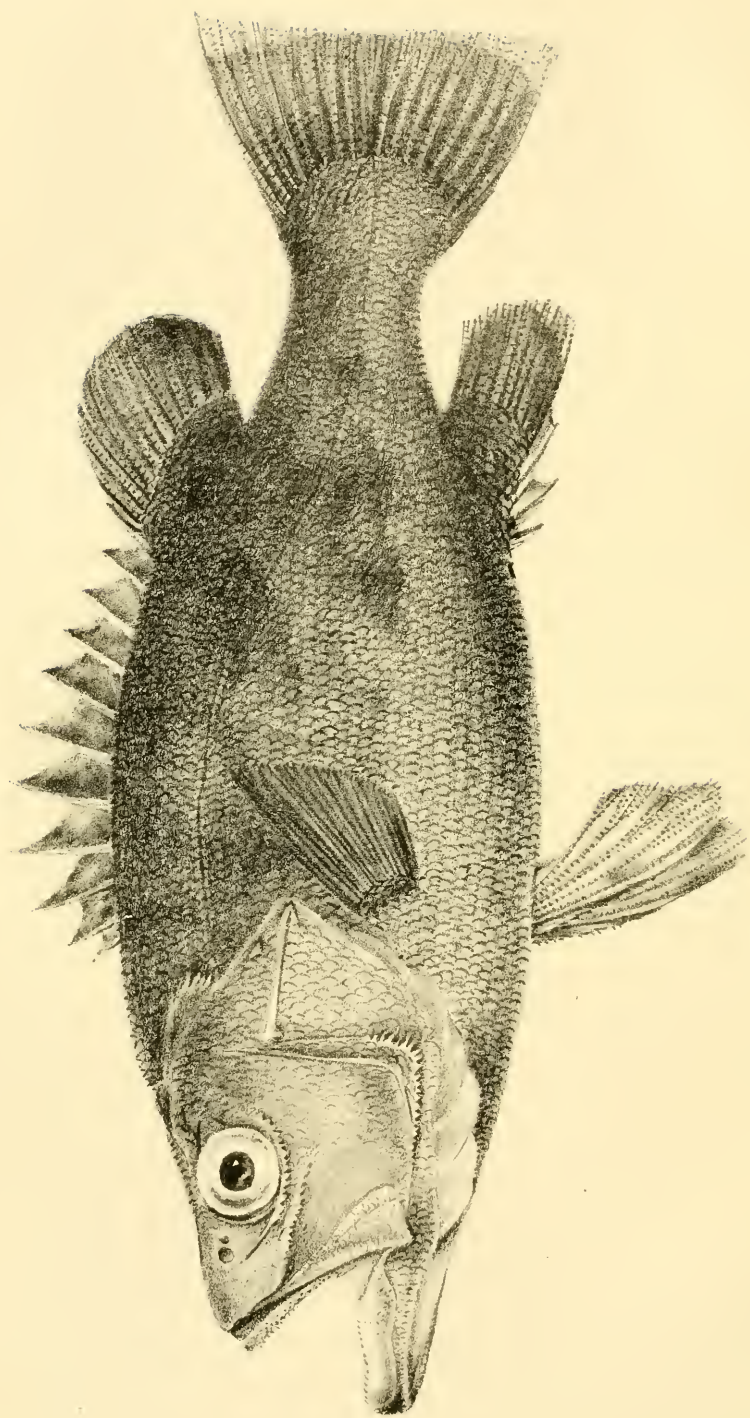
*f. 2.* do. do. in *Sebastes Kuhlii*, t. xvii. *supra*, from an example eleven inches long.

*f. 3.* do. do. in *Sebastes imperialis*, t. xxiv. *supra*, from an example fourteen inches long.

All the figures in this plate are of the natural size. *ff. 1, 2,* and *3* are brought into their natural position relatively to a fish placed horizontally with its head to the left hand of the spectator, by holding t. xxv. so that the fish engraved thereon becomes vertical, with the head downwards.









## TAB. XXVI.

## POLYPRION CERNIER.\*

*Cherne, ou Chernotta.*

THE SHERNY, SHERN, OR WRECK-FISH.†

## CHAR. GEN.

Corpus oblongum abbreviatum, incrassatum; capite rictuque amplo; dentibus scobinatis. Operculum superne carina longitudinali echinato-serrata, in spinam excurrente: præoperculo capitisque humerique cristis ossibusve prominentibus echinato-serratis.

Pinnæ dorsalis (unicæ), analis, ventralisque spinis striatis; plus minus echinato-serratis. Pinna caudalis simplex, truncata. Squamæ asperæ, parvæ. Membrana branchiostega septem-radiata.

*Obs.*—Pisces ingentes, alticolæ: juniores vagabundi, *φιλόσκιοι*, navium fractarum materiaeque fluitantis sequaces; edules, mæsticocolores. Species adhuc unica, fere cosmopolita.

*Polyprion cernium*, (Val.) Cuv. R. An. ii. 145.—Zool. Journ. ii. 120.—Cuv. et Val. iii. 21. t. 42.—Yarr. Suppl. 1.—Syn. Mad. Fish. 174.

*Serranus Couchii*, Yarr. Brit. Fish. 1. 12.

*Holocentrus Gulo*, Risso, Hist. iii. 367.

*Scorpena Massiliensis*, Risso, Ichth. p. 184.

"*Amphiprion Americanus* et *Australis*, Schn." Cuv.

*Chatodon Leachii*, Bowd. Exc. in Mad. p. 124, partim.

D. 11 + 11 v. 12; A. 3 + 8 v. 9; P. 17 v. 18; V. 1 + 5; C.  $\frac{4 - 6 + \text{VIII.}}{3 - 5 + \text{VII.}}$

M. B. 7; Sq. lin. lat. indefinitæ; Vertæ. 13 abd. + 14 cand. = 27.

*α. sinus*; rostro brevi lato obtuso, ore largo.

"Cherne de boca redonda."

*β. rostratus*; rostro producto acuto.

"Cherne Bicuda."

*Longit.* = 2 — 4 ped. = 3 × *longit. capitis* = 3 × *alt. fere*.

*Tempus*, per totum fere annum, sed hieme præsertim.

*Locus*, in profundis, sive in alto.

A FISH, remarkable both for its size and rarity, had been for some years known imperfectly to English naturalists; having been occasionally

\* The usual name "*Cernium*" is erroneous in its termination, whether taken classically or vernacularly. One of the common names is therefore here adopted in its simple form: having the further recommendation of agreeing in its termination with the masculine of a common class of Latin adjectives.

† It is often called Jew-fish by the English in Madeira, under the notion that it is the West Indian fish so called, which is, however, of the "Pargo" tribe.

taken, following pieces of floating wreck or timber, in the mouth of the British Channel, or upon the coasts of Devonshire and Cornwall. By Mr. Couch, the Cornish ichthyologist, it had been supposed identical with the Stone-basse of Sloane, a Jamaican fish; which is, however, some species of *Gerres* (see Cuv. et Val. vi. p. 460): and subsequently, by Mr. Yarrell, who was then unacquainted with it, except through the drawing and description of Mr. Couch, it was referred, with close approximation to the truth, to the genus *Serranus* of Cuvier, under the name of *S. Couchii*. On the first view of the rude but characteristic figure of it, copied in the British Fishes (1st edit.), vol. i. p. 12, from Mr. Couch's drawing, I was at once struck with its resemblance to the common Cherne of Madeira, the *Polyprion cernium* of Valenciennes: and this identification has, by Mr. Yarrell, since been perfectly established. (See Brit. Fish. Suppl. 1. p. 2.)

Although this fish is stated\* to be very common in the Mediterranean at the present day, it seems to have escaped entirely the notice of the ancient Greek and Roman naturalists. It is still more strange that no trace of it appears in Rondelet, Salviani, Willughby, or Linnæus: and its first record by Schneider is said, by MM. Cuvier and Valenciennes, to have been derived from a drawing, communicated by the English naturalist Latham, of an American example. By the earlier writers above named, if occasionally seen, it might be easily confounded with the Basse (*Labrax Lupus*, Cuv.), or the Umbre (*Corvina nigra*, Cuv.); with which it offers considerable agreement, both in habits and in general aspect: and this may perhaps account for its omission also by the later writers of the seventeenth and eighteenth centuries.

The Shern or Sherny has an extensive geographic range: for, without following it into the Pacific ocean with MM. Cuvier and Valenciennes, on the less perfectly conclusive authority of Forster's drawing and description of his *Perca prognathos* from Queen Charlotte's Island, it has been taken not only in the British Channel and the Mediterranean, but at three points of an equilateral triangle embracing almost the whole of the Atlantic Ocean; viz. at the Madeiran and Canarian Islands, at the Cape of Good Hope, and more recently by D'Orbigny at the mouth of the great estuary of La Plata, on the opposite shores of South America.† In Madeira, where it occupies the place of the Mediterranean *Corvina nigra*,‡ or *Sciæna Aquila*, it is one of the commonest and best known fishes in the market; being in general more highly esteemed for the table than it deserves, probably because it is the only tolerable fish of proper size and shape to form what people call "a

\* Cuv. et Val. iii. 21, 29.

† See Cuv. et Val. viii. 475.

‡ This fish is sometimes seen, but hitherto has not been captured, in Madeira. It is well known at Lisbon by the name of "Corvina."

handsome dish." Its flesh, indeed, is beautifully white, but somewhat coarse, and without any particular excellence of flavour; being altogether of too firm or tough a fibre to allow it to be called of first-rate quality. Possessing a high degree of muscular irritability,\* it requires to be kept at least twenty-four hours before boiling; and the tail-end is the best part of the fish. The epicure's portion is the gelatinous skin and more tender flesh amongst the interspinals at the root of the fins. It is sold in the market by the pound throughout the year; but is perhaps in most abundance about Christmas. The price varies from half a bit (twopence-halfpenny) to a bit (fivepence) the pound. I have taken it in spawn in August; but have not been able to detect any superiority of flavour in it at one season above another.

The Sherny in Madeira is only captured by the hook; and though shoals of small fishes, weighing from five to twenty pounds, and called Chernotta, are said to be often taken near the surface, in the neighbourhood of floating wreck or logs of wood, the proper habitat of the full-sized fish, weighing from thirty to one hundred pounds, is from one to two or three leagues from shore, and at the enormous depth of from twelve to fifteen or sixteen *linhas*, or from three hundred to four hundred fathoms. With a strong line† of this length, to the bottom of which is tied a stone (called the "*pendula*") of three or four pounds' weight, and having attached immediately above the stone, at intervals of eighteen inches, from twelve to fifteen strong hooks, baited with pieces of Cavallo (Mackerel) or Chicharro (Madeiran Horse-Mackerel), I have been frequently assisting at their capture. Coming up from these enormous depths, the fish becomes so distended with gas, expanding upon the removal of the vast pressure below, that it rises to the surface, not indeed entirely dead, but wholly powerless, and in a sort of rigid cataleptic spasm: the stomach is usually inverted, and protruded into the mouth; and the eyes in general are forced so completely from their sockets, sticking out often like two horns, that "eyes like a Cherne" is a common phrase amongst the fishermen for a prominent-eyed person. Sometimes, from the same cause, it rises faster as it approaches the surface than the line can be hauled in; shooting quite out of the water at some distance from the boat upon its first emergence, like a cork or bladder, from the lightness caused by its great distension. The usual size of these was from two and a half to three and a half feet long, weighing from twenty-five to forty or fifty pounds. Fishes from fifty to a hundred pounds in

\* The fishermen affirm that its heart beats two days after capture. I have seen it beating six or eight hours after apparent death.

† Each boat is generally furnished with two such lines, each worked by a single fisherman, who is, however, assisted by others in the labour of hauling in the line, which takes from twenty to thirty minutes.

weight, are, however, by no means exceedingly uncommon; but they are rarely seen of greater size.

The fishermen pretend to distinguish two kinds of Sherny, one with a long and pointed, the other with a broad and short muzzle: but I have ascertained these to pass by such imperceptible gradations from one to the other, whilst the characters themselves are even in extreme cases little appreciable, besides being accompanied by no other constant marks of difference whatever, that, except for a safeguard against future error, it were scarcely worth while recording them as varieties. The "Chernotta" is confessedly, as it is obviously, merely the young or small-sized fish.

The Portuguese name *Cherne* seems to be but another form of *Cernio* or *Cernia*\* the Nicene, or *Cernier* the Marseillaise name of this fish: and MM. Cuvier and Valenciennes trace up these words through their Italian representatives of *cerna*, or *cernua*, to *cernere*. According to this account, it would appear that the name *cerna* or *cernua*, being applied to the small refuse fishes in the market, which are *picked out* or *set apart* from others to be sold separately, has come to be used more particularly to designate in different places different species of the Perch-tribe,† which often form indeed the mass of such *rejectamenta*; and hence (?), to designate emphatically the Percidous Sherny. It must be owned, this reasoning is not very clear: but I am unable to supply a better etymology; only hinting a suspicion that the Spanish language might afford one. The lists of Canarian fishes contain a "Cherna:" which throws light at least upon the following passage in Pennant's history of the Common Cod-fish (*Gadus morhua*, L.). "There are, nevertheless, certain species (of the Cod-fish genus) found near the Canary Islands, called Cherny,‡ of which we know no more than the name; but which, according to the unfortunate Captain Glass, are better-tasted than the Newfoundland kind."§

The Sherny is a plain, dull-coloured, and clumsy, coarse, or heavy-looking fish; of an ungainly or unwieldy figure and proportions, being much too thick and deep for its length; with the mouth or gape and gill-opening very wide, and an enormous head. Its resemblance and generic affinity to *Serranus* are much greater than would be apprehended from a mere inspection of MM. Cuvier and Valenciennes' figure (t. 42),||

\* Risso, by a manifest misprint, has *Lernio* or *lernia*.

† Hence perhaps Belon's use of it to designate the Ruffe (*Acetina vulgaris*, Cuv.; or *Perca cernua*, L.) Gaza had long before arbitrarily applied it as a translation of the *ἀγφὸς* of Aristotle.

‡ "Hist. Canary Islands, 193."

§ Penn. Brit. Zool. iii. 173.

|| It is to be regretted that these authors do not state the size of the example from which their figure was derived. This should always be done; but especially in the case of large fishes, which are apt to vary considerably at different stages of their growth.



in which the crests and echinulations about the head and fin-rays are either much exaggerated, or at least much stronger than in any state of the Madeiran fish. The nearest approach to it was in the small example excellently figured by Mr. Yarrell in his Supplement. But larger adult fishes are uniformly very plain about the head, and have the fin-spines nearly unarmed: and under this their usual aspect, they can only be distinguished from *Serranus* generically by their short deep unwieldy shape, by the subserrate opercular keel ending in a single strong spine, and by the grooved or striated fin-spines.

Shape oblong, suddenly contracting at the end of the dorsal and anal fins, short or deep in proportion to the length; compressed, but thick and bulky. The greatest depth equals the length of the head, and is contained about three times in the length. The greatest thickness equals, or exceeds a little, half the depth. The curvature of the dorsal and ventral outlines is moderate and equal. Head very large, with both the mouth and gape enormous: the muzzle a little varying in length or sharpness, but always blunt and broad. The lower jaw projects beyond the upper, when the mouth is closed, as in *Serranus*; but is neither distinctly notched nor tubercled at the tip. Both jaws are furnished round the edges with bands of fine brush-like teeth; the bands are broadest in the upper jaw. The palatines have a broad band, and the vomer a patch of the same; and at the root of the tongue there is also another triangular rough patch. The tongue is broad, and flat or thin; and otherwise quite smooth. There is a distinct veil inside, in front of both jaws.

The nostrils are two simple orifices, close together, in the usual place.

Eyes of moderate size, rather small; their diameter about one sixth, sometimes approaching to one fifth, of the length of the head; often by spasmodic action, or expansion after capture, singularly protruded from their sockets like two blunt horns. Lower half of the orbit bony, ridged, and roughly serrate: the upper half plain, but with a sort of naked bony echinato-striate eyebrow above.

The upper and lower edges of the suborbital underneath the eye form two bony echinato-serrate ridges: the former compassing the lower half of the eye, of which it forms the orbit.

The limb or border of the preopercle is both confusedly scaly and echinato-granulate or striate, with its outer edge spinoso-serrate, and its raised inner rim nearly entire, or only here and there echinato-granulate or serrate.

The lower part of the edge of the subopercle, like the upper of that of the interopercle, is striato-dentate; but the remainder of their edges is entire.

Opercle towards the top with a strong horizontal bony ridge or keel, which is more or less and irregularly echinato-serrate, and is produced into a strong adpressed spine. The upper point or angle of the opercle, and its ridge, are very obsolete.

The top of the head between the eyes is plain, broad, and flat; nearly equaling in width twice the diameter of the eyes. It is mostly granulato-scabrous, and has two pencils of bony striæ converging inwards from a point on a line with the hinder edge of the orbits. Close behind, and almost upon the nape, is a short bony crest-like hump, or ridge, forming a little keel, beginning at a point halfway between the line of the fore-edge of the orbit, and the beginning of the dorsal fin, but extending a very little way towards the latter.

These ridges, crests, or keels about the head, are more prominent and rough, or echinate, in young than in full-grown examples. But in all cases the head has a plain unarmed appearance, like *Serranus* rather than *Scorpena*.



The supescapulary of Cuvier is a parabolic bony plate, at the origin of the lateral line, with the edge striato-dentate. In the upper axil of the pectoral fins there is a partly smooth or naked triangle, formed by the upper part of the *humerus* (n°. 48) and the upper *coracoid* (n°. 49) of Cuvier.\* The borders of these bones are naked, and striato-dentate.

The ridge of the back in front of the dorsal fin, with the exception of the short nuchal crest, is not keeled.

Scales small, rough-edged, and ciliate, harsh but not rigid. The only parts about the head that are quite smooth, or naked, are the broad lips (formed by the intermaxillaries in the upper jaw), and the tip of the lower jaw.

The lateral line follows the curvature of the back, and is not very conspicuous. Its scales are too confused or numerous to be worth counting: at the base of the caudal fin they are altogether indeterminable.

The dorsal fin begins over the point of the opercular spine, or fore-axil of the pectorals. The distance from the tip of the muzzle to its origin equals that from the end of its base to the edge or tip of the caudal fin; and the whole length of its base occupies more than the middle third of the whole length of the fish. Its spiny fore-part, which is about two thirds of the whole, is low and even, with the spines of nearly equal length. The fourth and two or three following spines are the longest, but scarcely exceed one fourth part of the depth of the body below them. The web between them is deeply notched. The last spine is rather longer than the last but one, and forms the fore-edge of the soft-rayed portion of the fin, which is short, abrupt, and rounded, and twice the height of the spinous fore-part.

The anal fin corresponds in position with the hinder soft-rayed portion of the dorsal, but is somewhat more produced and truncate behind. Its third or last spine is the longest.

The spinous part of both these fins is seated in a deep groove: their soft-rayed part is thick and fleshy at the base, and covered nearly halfway up with scales, which extend also further still between the rays. Their last ray is double or forked to the base, and free behind.

Ventral fins rather large, one seventh of the whole length of the fish, placed on a line with the commencement of the dorsal fin. Their last ray is partly connected with the body by a web.

Spines of the dorsal, anal, and ventral fins very strong, and grooved or striate longitudinally in waved lines. In adult full-sized fishes of three feet long and upwards, they are all unarmed: but in small or young examples some or all are more or less regularly dentato-serrate, or coarsely echinate in front; those of the ventral fins, and the fore ones of the dorsal and anal, being the most remarkably or copiously armed in this way. Between these two conditions, various intermediate states occur: the spine of the ventral fins retaining the character the longest.

Pectoral fins ovato-triangular, small, about the size and length of the ventral. Their rays have a coarse rough shagreened appearance, and they are scaly at the base between the rays. They are placed on a line with the ventral or origin of the dorsal fin, about one third of the height up the side.

Caudal fin large, equilaterally triangular, short, evenly truncate, with the angles acute, scaly at the base all over, and further up between the rays.

Colour dull leaden-ash or grey, varying to pale drab-brown; paler or whitish on the throat and belly and about the gill membrane, darker towards the back, and blackish at the top of the head and nape. Sometimes the whole is washed with a faint violet or vinous tint. Only young examples below two feet in length

\* This is well represented in MM. Cuvier and Valenciennes' plate, t. 42.

are occasionally varied on the sides with paler and darker clouds. The dorsal, anal, pectoral, and caudal fins are always uniform dark-brown approaching to black. The borders or edges of the ventral, anal, and angles of the caudal fin, are generally one or all pure white; and the web of the spiny part of the dorsal, anal, and ventral fins is paler than the others, and somewhat clouded or mottled with white. The cornea of the eye above is coloured like the back: the iris is, on capture, dark rich brown and gold, or sometimes coppery, with bright violet streaks: but it soon turns uniform dead silvery white. The pupil is black, and not in the least opaline.

On dissection, the cavity of the abdomen proves to be large, with the mass of viscera proportionably small, and altogether pale or whitish. The liver is rather large, with a remarkably long duct. The stomach, though the fish is a voracious feeder, is rather small, conico-cylindric, and with a thick hard coat. The cæca are short and slender, but extremely numerous, and indefinite in number,\* forming a thick double conglomerate bunch, or bundle, like the glandular panereiform mass of the Tunnies; nearly as large as, though shorter than, the stomach. Each of the two portions of this bundle is again subdivided into several conglobate groups, or fascicles, with a common trunk or stalk. Intestine large and voluminous, making five or six volutions, amongst which is involved the dark-red spleen. Air-bladder large and oblong, attached completely to the spine, from which it is not separable without rupture.

The vertebrae are twenty-seven in number, of which fourteen are caudal.† Of the thirteen abdominal vertebrae, the six or seven last are furnished with widely divaricate apophyses beneath; the three last pairs of these being partly combined at the base by a transverse rib. The vertebrae are all strong, thick, and short; the first being rather shorter than the following. The bony crest, or short keel on the back of the scull, or nape, is formed by a prominence at the fore-end of the interparietal.

It has been remarked already, that, in point of quality or flavour, there is no appreciable or constant difference in this fish at different seasons of the year. I have taken the female with two enormous yellow masses of eggs, well developed, in August. The individual was of large size, measuring three feet four inches in length; but it possessed no peculiar excellence, though a good fish. Other examples, taken at the same season, of both male and female fishes, were equally good eating, though not in milt or roe.

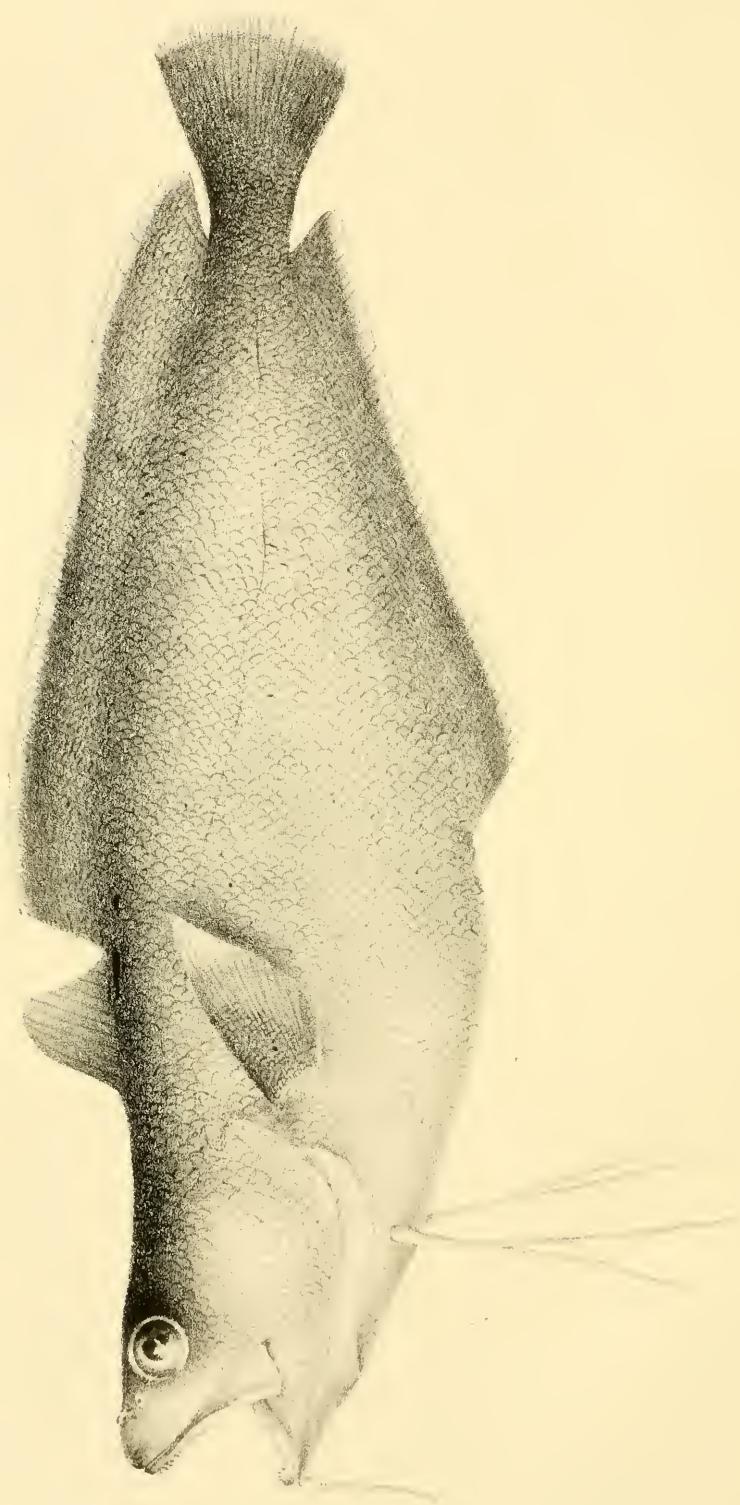
The individual figured, taken early in April, measured about an inch more than two feet in length. The spines of the dorsal, anal, and ventral fins were almost even or unarmed, with only a faint tooth or prickle here and there.

\* MM. Cuvier and Valenciennes, probably from the partial decomposition of the viscera in their example, say, "There are only two cæca, one very short, the other very long."

† MM. Cuvier and Valenciennes say that there are thirteen abdominal, and thirteen caudal vertebrae.









TAB. XXVII.

PHYCIS MEDITERRANEUS, LAR.

*Abrotea.*

THE SEA-TENCH, OR MADEIRAN WHITING.

CHAR. GEN.; vide supra tab. VII.

CHAR. SPEC.

P. pinna dorsali prima subdececmradiata rotundata humili brevi, secundam analemque altitudine hand superante: ventralibus capite sublongioribus.

I<sup>ma</sup>. D. 9 — 11; 2<sup>da</sup>. D. 65; A. 62; P. 18. v. 19; V. 1; C. 5 + XX + 6

M. B. 7; Vertæ. 14 abd. + 33 vel 34 cand. = 47 v. 48.

*P. Mediterraneus*, (Lar., *P. tinca*, Schn.) Cuv. R. An. ii. 335.—Risso, iii. 222.—Syn. Fish. Mad. 189.

*P. fureatus*, Bowd. (nec aliorum) Exc. in Mad. 122. f. 28; *male*.

*Blennius Phycis*, Linn. i. 442. n<sup>o</sup>. 7.

*Phycis*, Art. Gen. App. 84. n<sup>o</sup>. 5.—Rondel. 186.

*Phycis*, β. Art. Syn. App. 111.

*Asellus Callarius* Bellonii, Salviani; *Tinca marina*, Aldrov.; *Phycis* Rondeletii, Gesn. p. 345; *Mastœ affinis*, Will. 205. t. N. 12. f. 3 (copied from Salviani).

*Callarius* sive *Tinca marina*, Salv. 231. t. 93; *opt.*

*α. cinerea*; corpore cinereo, pallido.

Salv., Will., Bowd., ll. cc.

An *P. Gmelini*, Risso, iii. 223? Confer Cuv. R. An. ii. 336, note.

Vulgatiss.

*β. coffeacea*; corpore fusco-nigrescente.

Rondel., Art., Risso, ll. cc.

Rarior.

*Longit.* = 1 — 2-pedalis = 4 × alt.

*Tempus*, autumnno, hieme; sed per totum annum.

*Locus*, in mediis profundis: *α.* vulgatiss: *β.* rarior.

RONDELET seems to have been mistaken, although he has been followed in the notion by Artedi, in referring Aristotle's *φυκίς* to this fish; which is rather the *Callarius* of Pliny, the *ὄνος καλλαρίας* of Archestratus in Athenæus, Z. 99,\* and the *καλλαρίας* of Oppian, A. 105;

\* Ed. Dindorf, ii. 633. The *ὄνισκος γαλλαρίας* of Dorion in Athen. Z. 90. d. (Dindorf, ii. 630), is even still more doubtful; and, from his associating and comparing it with his "River-Marena"

though this supposition rests upon no very clear or certain grounds. However, the true *φυλῖς* of Aristotle, which, from report, he characterizes as the only sea-fish which makes nests and brings forth in them,\* appears to be much more safely identified with a little Mediterranean Goby (*Gobius*), in which Olivi has observed, according to M. de Mertens, this peculiar habit.† And it is remarkable, in confirmation of this view, though it has escaped notice, that Rondelet himself had long before, on the authority of Pelicer, Bishop of Montpellier, attributed this habit also both to Gobies and to Hippocampuses; without inferring from the fact, however, the identity of the former with Aristotle's *φυλῖς*.‡ His observation, moreover, in reference to the subject of this chapter, passing over its equivocal phraseology§ and deficiency of detail, has never been confirmed; and, though the fish is taken in abundance at the proper season in Madeira full of spawn, the fishermen are unaware of any such peculiarity.

Other fishes in which a similar economy has clearly been detected, are the Hassars of Demerara (certain fresh-water species belonging to the mailed Siluridæ), and the celebrated Goramy of Java and the Mauritius, *Osphromenus Olfax*, Comm.||

The Codfish tribe is, in its geographic range, almost confined to the colder or more temperate regions of the globe; and, in the absence of much positive information relative to their existence in the corresponding parallels of southern latitude, the focus of its species may be stated to extend from about forty to sixty degrees of north latitude, and its principal genera to be composed of fishes from the northern hemisphere. Such are the common Cod, the Haddock, Whiting, Coalfish, Ling, and Tusk, or Torsk. The genus *Phycis*, with the Hake (*Merlucius vulgaris*, Cuv.), passes further south: and, as in this direction the former-mentioned fishes disappear, the *Phycides* become more numerous; taking

(τὴν ποταμίαν μέραν), on account of the latter having only "one spine" (μίαν ἄκανθην), which cannot possibly mean, as Rondelet and Salviani understood it, not attending to the exact force of the word *μίαν*, a continuous (ἀναρόχως) or an exappendiculate backbone, may be referred more safely to the tribe of Siluridæ. Confer Salv. p. 74 and Rondel. pp. 401 and 414. The former labours to prove of the Hake, that it may be said to have only one spine, because its ribs are connate to the vertebrae, not separable by boiling, retuse at their tips, and very short; so that they cannot properly be called spines! To such reasoning it can be only needful to reply that there were many other fishes well-known to the ancients in the same condition; whereas the character in question is surely rather to be sought for in some external peculiarity belonging to the fins. Rondelet absurdly thinks that this ὄσπικος was the Sturgeon. Salviani subsequently (back of p. 232) thought it was the Sea-tench.

\* Arist. *Θ.* xli. 3.

† See Cuv. et Val. xii. 7.

‡ Vide Rondel. pp. 187, 196.

§ "In media alga nidificantem vidi." It may be doubted whether he ever actually saw the fish doing more than lurking amongst the seaweeds.

|| See Dr. Hancock's and General Hardwicke's interesting papers in the Zoological Journal, vol. iv. pp. 245, 309.

in Madeira and in the Mediterranean their place, but very inefficiently supplying it both in regard to quality and numbers.

The Sea-tench, however, in Madeira, when in season, that is, from October to December, when it is also in milt or roe, is a delicate, good fish; often compared, as it was long ago by Willughby, to the Whiting, which it resembles in taste, but more in the tenderness, transparency, and lightness of its flesh when boiled. Thus in its season, both of breeding and of finest order for the table, the Sea-tench does not depart from the general habit of its tribe. Mr. Yarrell says of the common Codfish (*Morrhua vulgaris*, Cuv.), that it spawns about February, and "is in the greatest perfection as food from the end of October to Christmas. It may, in fact," he adds, "be said of the whole family of the Gadidæ, that they are in the best condition for the table during the cold months of the year."\*

The Sea-tench is, according to Cuvier, called in the Mediterranean *Molle*, or *Tanche de mer*. Rondelet gives *Mole* for its Provençal, Salviani *Tenca marina* and *Pesce fico* (which Rondelet reporting, and pre-disposed to find in it Aristotle's *φυζις*, has spelled *phyco*) for its Roman name: both the first and last being probably derived, as these authors have themselves observed, from the softness of its flesh. An enthusiastic etymologist might be sorely tempted, following this lead, to look at once for the origin of its Portuguese name, Abrotea, in the Greek ἀβρότης, or ἀβρός, ob carnem delicatam, friabilem, mollem. The wild Asphodel (*Asphodelus ramosus*, L.) is, according to Brotero, also called Abrotea: and it is possibly from some fanciful or unexplained connection with this plant that the fish has come to be so called. I find a "Brotá," which is said to be the same fish as the Madeiran, in a list from Teneriffe. At Nice, Risso reports that it is called "Moustella bruna." On the British shores it is unknown; the only kind of *Phycis* they possess being the true *P. furcatus*, Cuv.

The Abrotea, or Sea-tench, is taken in Madeira from a depth of two or three fathoms, close in shore, to one of two or three "linhas," or a hundred fathoms; and if never in profusion, like the Mackerel or Bonito, being a solitary, not gregarious fish, it is scarcely ever absent altogether from the market.

The late Mr. Bowdich was misled, by an accidental monstrosity or mutilation in the example which he figured, into the formation of a species; to which he gave a name pre-occupied by a very distinct member of the genus, which has not yet occurred in Madeira, though it is found both in the Mediterranean and Britain, the *P. furcatus* of Cuvier, the Great Forked Beard, Forked Hake or Hake's Dame of Yarrell's

\* Brit. Fish. ii. 143.

British Fishes, vol. ii. p. 201. This fish is chiefly characterized by its long ventral beards or rays, which are twice the length of the head, and by the high and pointed first dorsal fin, which resembles in shape and elevation that of *P. Yarrellii*, t. vii. supra, but is ten-rayed.

Shape elongated, thickish forwards at the head and shoulders, much compressed and thin towards the tail: the dorsal line is nearly straight and horizontal, with a rather abrupt and marked depression at the nape; the ventral line is rather protuberant, ascending from the commencement of the anal fin. The greatest depth is at about one third of the whole length of the fish, or at the origin of the second dorsal fin, and is one fourth of the whole length; but at the root of the caudal fin it is scarcely one sixteenth of the same. The greatest thickness is from the cheeks nearly to the tip of the pectoral fins, and a little exceeds half the greatest depth.

The head in length equals the greatest depth. It is small and depressed, or low and flat at the top between the eyes; and the cheeks behind these are very fleshy, thick, and tumid. The eyes are small and round, with plain flat fleshy orbits: the space between them exceeds but little their diameter, which is from one fifth to one sixth of the length of the head. Sometimes, as in the Cherne, they are spasmodically protruded from their sockets. The mouth and gape are large and wide: the muzzle short, broad, and depressed like a frog's: the lower jaw is shorter than the upper, with a short flexible beard at its tip or symphysis beneath. The teeth are small, but sharp, and thick-set in rather broad bands around the edges of both jaws, and in a heart-shaped patch upon the vomer; but there are none whatever on the palatines: the rest of the roof of the mouth being, like the broad and thin or flattened tongue, quite smooth.

The whole head is quite plain and unarmed. The edge of the opercle is thin and membranous, and that of the preopercle is covered and concealed by the skin. The humeral bones are also indiscernible externally.

The pectoral fins are oblongo-spatulate or ear-shaped, rounded at the tips,\* rather small or narrow, and placed halfway up the side. They are in length about one seventh of the whole length of the fish.

The ventral fins consist each of a single forked and fleshy compressed filament, placed considerably before the pectoral fins low down on the throat, halfway between the base of the pectoral fins and the eye. They are a little longer than the head.

The first dorsal fin is placed forward, beginning over the upper or anterior end of the base of the pectoral fins. It is small, low, and triangular, with the tip or apex rounded and not pointed. Its height about equals the length of its base; and the third and three following rays are the longest.

The second dorsal fin begins close behind the first, and continues of nearly equal height or breadth, with a straight and even edge, to the root of the caudal fin. Its height does not exceed that of the first dorsal fin; being from one third to one fourth of the greatest depth of the body.

The anal fin commences a little behind a point opposite to the origin of the second dorsal, with which it corresponds in every other respect, being only a little narrower.

The caudal fin is small, and fan or wedge-shaped.

All the fins are soft and fleshy or rather leathery, with the rays indistinct, or obsolete. The dorsal and anal fins are very thick and fleshy at their base.

\* By an error in engraving, they are incorrectly represented to be pointed in the accompanying figure. Their form is better given by Salviani or Willughby: but still not quite correctly.



Whole body reticulated with rather small and indistinct, vertically lunate scales, which when removed are found to be longitudinally oblong, soft, entire, and of the cycloid structure. Only the muzzle and lips are naked. The fins, especially the first dorsal, are apparently naked; but really are reticulated halfway up or more from their base with small obscure scales.

The lateral line is narrow, distinct, and somewhat chain-like. It runs nearly straight to the tips of the pectoral fins, and then, descending gradually to the middle of the sides, continues again in a straight line to its termination. It is generally even; but sometimes, as in the example figured, has a festoon or sinus in some part of its course, or else is a little wavy at its origin.

The usual colour is an uniform light greyish-brown or pale ash, with sometimes a leaden, sometimes an olive tint; the back, head, lips, and fins towards the borders being darker and approaching to black, with the edges of the second dorsal, anal, and caudal, and the tips of the pectoral fins white. The ventral forks or filaments are pale or whitish, sprinkled with grey specks. In the variety  $\beta$ , which is however comparatively rare, the whole fish is of a rich deep coffee-colour, relieved in parts on the sides of the head and shoulders with brighter saffron or golden-brown tints, paler under the throat, but scarcely so on the sides or belly: the fins are almost black towards their tips or edges, and fimbriated with pure white and orange flesh-colour: the whole in colouring reminding one somewhat of the Tench (*Tinca vulgaris*), or the Mero of Madeira (*Serranus fimbriatus*). Intermediate or transition states as to colour between these two varieties occur: some having the head coffee-coloured and the body of the usual pale ash; whilst others are pale ash, clouded or mottled with coffee-brown: and I have not observed them to correspond with any regularity to particular seasons, or to either of the sexes.

The iris is either pale brassy, or in  $\beta$ . rich coffee-brown on a golden ground, the inner edge being clear brassy. Its upper part is darker than the rest. The pupil is bluish or rather violet-black, not opaline. The vent is surrounded by a broad livid-black ring, or rather may be said to be in the middle of a round black spot. The bands or groups of teeth are red or flesh-colour: the rest of the mouth inside, with the tongue, being pale or white.

On dissection, the liver is found to be pale-coloured, and very large, having both its lobes excessively elongated, and reaching even beyond the vent. The stomach is large, oblongo-pyriform, or simply pear-shaped. The cæca are very distinct and numerous, being upwards of thirty in number. They are long and slender or vermiform, and somewhat stiff or firm in substance. The intestine makes one long complete, and then two short half volutions; proceeding afterwards straight to the vent. The air-bladder is singular from its constriction into three confluent chambers or compartments, placed one before the other;\* the hindmost being large and oval, the middle one much smaller and globose, and the foremost again larger and cross-shaped or transverse, like the head of the common Hammer-fish (*Zygæna malleus*, Val.), or bilobed with a wide and deep sinus in front. The parietes of each of these are very thick, strong, and fibrous: yet they are almost always found ruptured upon capture.

As in the Cherne and some other fishes, the stomach by spasmodic action becomes very frequently inverted, rising up into the mouth; in which state it was mistaken by Mr. Bowdich for the air-bladder. The mouth is also generally gaping, and the branchial membrane and the muscles of the throat and jaws are left spasmodically outstretched in a state of rigid tension after death.

There are fourteen abdominal, and usually thirty-three, but sometimes thirty-

\* These were figured by Willughby, p. 205, long ago, and are well described by Laroche in his "Observations sur la Vessie aérienne des Poissons," p. 70.



four, caudal vertebræ. The two first abdominal are very short, with short oblique lateral apophyses: the third is short, with two short convergent approximate vertical apophyses beneath in its middle: the eight or nine last have long divergent rib-like apophyses. In the six or seven first caudal vertebræ, the apophyses form very wide arches; especially those of the two or three first, whose arches are almost circular. All the bones are peculiarly white and sub-opaque, comparatively with those of most fishes.

The Sea-tench in Madeira rarely exceeds the length of two feet, or the corresponding weight of four or five pounds. The example figured was nineteen or twenty inches long, which is about the usual size. It was of the pale or ash-coloured variety.

An Abrotea is said once to have occurred here weighing ten pounds. It was accounted quite a curiosity; but, when cooked, proved wholly worthless. Possibly, however, it might be a straggler of some other larger species of the tribe, such as the Ling, *Molva vulgaris*, Cuv.

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